KEYENCE

MEASUREMENT GENERAL CATALOGUE

KEYENCE

High Precision Measurement General Catalogue

LK-G5000 Series / LK-G3000 Series / LK Series / LJ-V7000 Series / LJ-G Series

SI-F1000 Series / SI-F80R Series / LT-9000 Series / LS-7000 Series

LS-3100/5000 Series / TM-3000 Series / IM-6500 Series

KEYENCE Measurement Technology Evolution

KEYENCE Corporation has continuously developed measurement technology for over 30 years. Each generation of measurement systems provided additional capabilities and significant improvements in inspection quality.

Surface Scanning Laser Confocal

Surface scanning provides a new level of stability and flexibility.

Confocal System

Revolutionary system enables new measurement capabilities for transparent materials.

LED+PSD System

Small sensor head and robust controller.

LASER+PSD System

Semiconductor laser enables small sensor head and high stability on shiny targets.

CCD Optical Micrometer

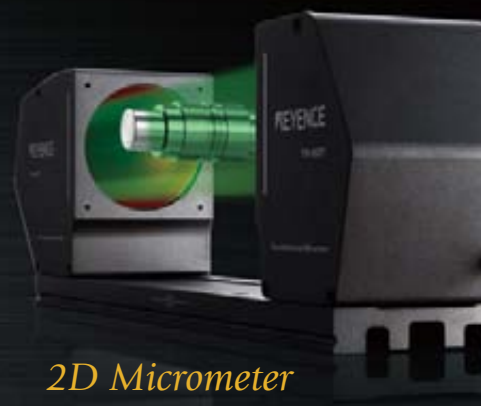
Innovative CCD based system enables high repeatability and high speed.

1970

History of development

Ultra High Speed Laser

Completely original design device achieves world's fastest sampling rate (392kHZ).



2D Micrometer

Inline imaging system measures 2 dimensions in with sub-micron precision.

E³CMOS 2D Laser

Newly developed high sensitivity receiver enables highly stable and accurate 2D measurement.

Spectral Interferometry

Original principle provides nanometer level measurement in a small sensor head design.

CCD Triangulation

CCD based receiver element enables stable measurement on any material.

High-speed 2D/3D Laser Scanner

64,000 profiles per second allow precision inspection of even the most difficult parts.

2012 and Beyond

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Laser Triangulation	LK-G5000 Series	Ultra High-Speed/High-Accuracy Laser Displacement Sensor
	LK-G3000 Series	High-Speed, High-Accuracy CCD Laser Displacement Sensor
	LK Series	CCD Laser Displacement Sensors
	LJ-V7000 Series	High-speed 2D/3D Laser Scanner
	LJ-G Series	High-Accuracy 2D Laser Displacement Sensor
Spectral Interferometer	SI-F1000 Series	Micro-Head Spectral-Interference Laser Displacement Meter
	SI-F80R Series	Spectral-Interference Wafer Thickness Meter
Confocal laser	LT-9000 Series	Surface Scanning Laser Confocal Displacement Meter
Optical Micrometer	LS-7000 Series	CCD Optical Micrometer
	LS-3100/5000 Series	Laser Scan Micrometers
	TM-3000 Series	High-speed 2D Measurement Sensor
Optical Measurement System	IM-6500 Series	Image Dimension Measurement System

- Fastest in the World 392 kHz
- Best linearity in its Class 0.02% of F.S.
- Connect up to 12 sensor heads/network capable

▶ P.10

LK-G5000 Series

- Sampling rate of 50 kHz
- Linearity of 0.05% of F.S.
- Repeatability down to 0.01 µm
- Can measure diffuse, specular, transparent or translucent targets
- Wide beam spot models are available

▶ P.18

LK-G3000 Series

- Linearity of 0.1% of F.S.
- Repeatability of 1 µm
- 30 µm diameter beam spot
- Ultra long measuring distance up to 750 mm
- Measurement unaffected by colour, surface texture or stray light

▶ P.24

LK Series

- An emphasis on inline measurement
- The world's fastest at 64,000 profiles/sec.
- Blue laser optical system

▶ P.26

LJ-V7000 Series

- Linearity of 0.1% of F.S.
- High-speed sampling of 3.8 ms
- Simultaneous measurement/judgement of up to 8 features
- Stable measurement for all targets

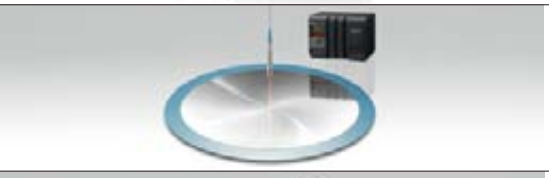
▶ P.34

LJ-G Series

- Resolution of 0.001 µm
- Micro-head size of ø2 mm
- Spectral interference method

▶ P.40

SI-F1000 Series



- Resolution of 0.001 µm
- Sampling speed of 5 kHz
- Working distance 80mm

▶ P.46

SI-F80R Series

- Precise 2 µm diameter beam spot
- 0.3 µm resolution

▶ P.48

LT-9000 Series

- High repeatability 0.06 µm
- High speed 2400 samples/second
- Maintenance-free design

▶ P.52

LS-7000 Series

- Repeatability of 0.3 µm
- Wide measuring range
- Touch-screen controller
- Up to four heads are connectable to one controller

▶ P.58

LS-3100/5000 Series

- Multi-point 2D measurement
- Tilt correction for inline measurement
- High-speed sampling of 5.5 ms

▶ P.62

TM-3000 Series

- A wide variety of measurement & auxiliary tools
- Cutting edge sub-pixel processing algorithm
- Simultaneous inspection of up to 99 features
- Revolutionary iPASS target position correction function

▶ P.68

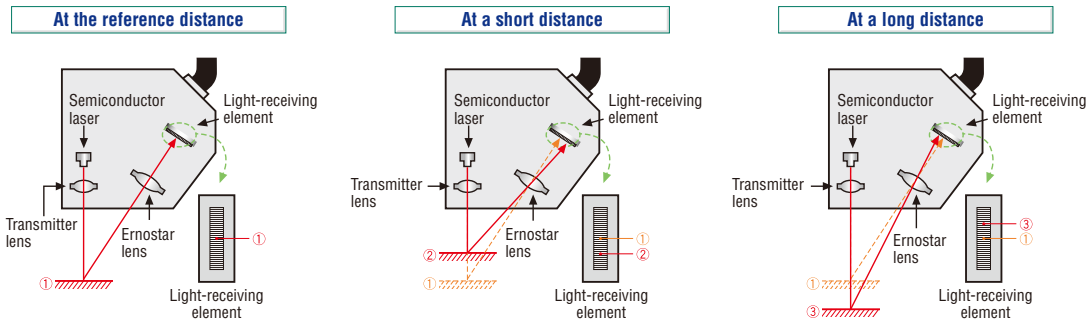
IM-6500 Series

PRINCIPLE

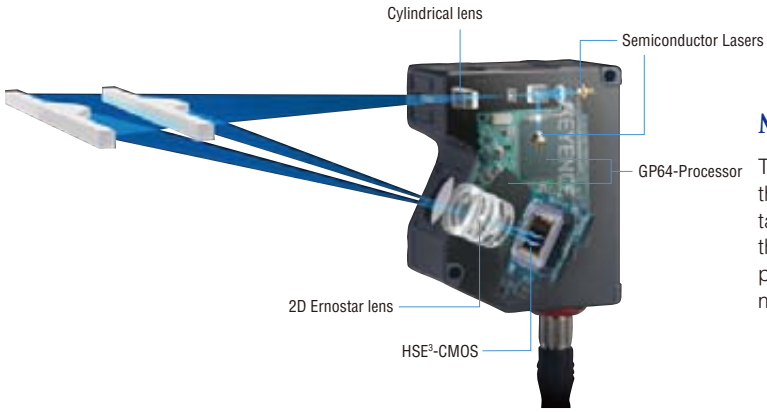
LK-G5000 Series Measurement Principle (Triangulation type)

HIGH-SPEED WIDE RANGE

The semiconductor laser emits the laser beam to the target as shown below. The light reflected off the target is focused by the ernostar lens and forms an image on the light-receiving element. The position of the beam spot on the receiving element varies with the distance to the target. This variation is evaluated and converted into a measurement of target position.



LJ-V7000 Series Measurement Principle

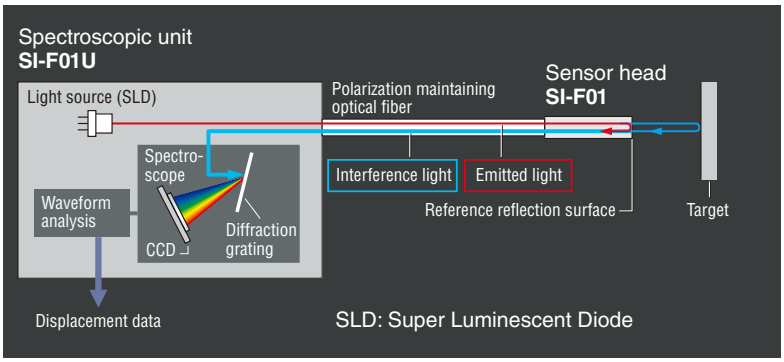


Measurement principle

The laser light is projected in a horizontal line by the cylindrical lens and diffusely reflects on the target object. This reflected light is formed on the HSE3-CMOS and by detecting changes in position and shape, displacement and shapes are measured.

SI Series measurement principles (Spectral-Interference type)

micro-head ultra high accuracy



SLD

Part of the broad wavelength light emitted from the SLD is reflected by the reference reflector mounted in the sensor head, while the part that passes the reference surface is mirror-reflected on the target and returns into the head.

Optical interference

The two reflected light beams interfere with each other. The intensity of the light with a specific wavelength is determined according to the distance between the reference surface and the target. The relative maximum interference is reached when the determined distance is an integral multiple of the wavelength.

Spectroscopic analysis

Splitting the returned light into different wavelengths with a diffraction grating produces an optical intensity distribution for a specific wavelength band. The distance to the target is obtained by carrying out waveform analysis on this distribution.

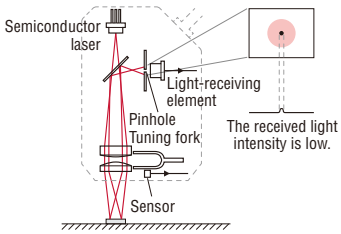
LT-9000 Series Measurement Principle (Confocal type)

CLEAR TARGET THICKNESS | HIGH-ACCURACY

High-accuracy measurement method uses the confocal principle and tuning fork

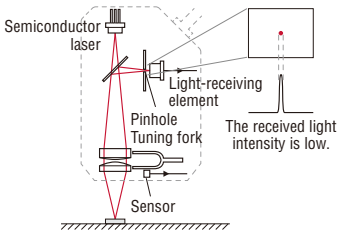
The laser beam is focused on the target surface through an objective lens that vibrates up and down at high speed by means of a tuning fork. The beam reflected off the target surface is converged on a pinhole and then enters the light-receiving element. By measuring the exact position of the objective lens when the light enters the light-receiving element, the target height can be determined. The sensor measures the distance to the target surface accurately without being affected by the material, colour, or angle of the target.

When the focal point is not on the target surface



A small amount of received light passes through the pinhole.

When the focal point is on the target surface



All of the received light passes through the pinhole.

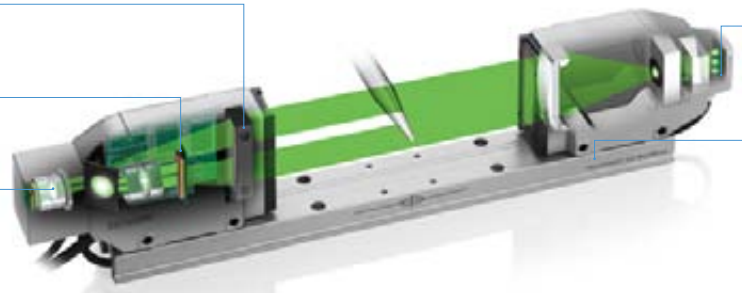
LS-7000 Series Measurement Principle (Thrubeam type)

HIGH-ACCURACY | LONG LIFE

Telecentric optical system
The system allows only parallel light to form an image, ensuring accurate measurement.

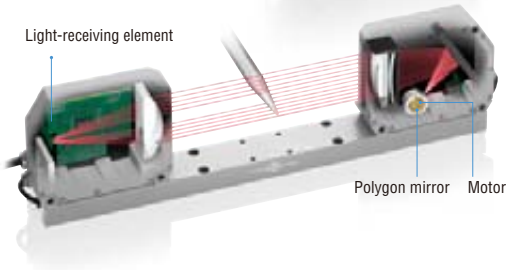
HL-CCD
This specifically designed CCD achieves high speed and improved accuracy.

CMOS monitor camera
Extremely compact CMOS camera captures an image of the target to aid alignment.



High-intensity GaN green LED
The light source features a gallium nitride (GaN) green LED that provides a short wavelength and reliable operation.

Collimator lens and special diffusion unit
This optical unit distributes Green GaN LED light as a uniform , collimated beam.



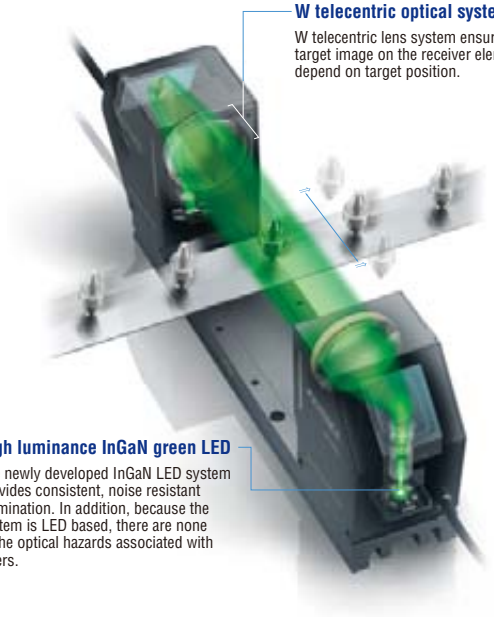
Improvement over the laser-scanning method

The green LED light is distributed as a uniform, parallel beam and is applied to a target. The edges between the bright and dark areas on the CCD detected and used to calculate a measurement value. The conventional scanning method as shown in the figure on the left uses a high speed motor, which limits the sensor's durability and stability. The solid state LS-7000 Series solves this problem and ensures excellent durability.

TM Series measurement principles (2D Thrubeam type)

MICRO-HEAD | ULTRA HIGH ACCURACY

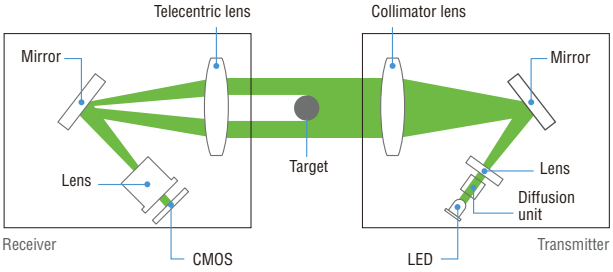
W telecentric optical system
W telecentric lens system ensures that the target image on the receiver element does not depend on target position.



High luminance InGaN green LED
The newly developed InGaN LED system provides consistent, noise resistant illumination. In addition, because the system is LED based, there are none of the optical hazards associated with lasers.

Principle of measurement

A collimated green LED beam is used to generate a shadow on the high precision CMOS receiver. This shadow is then analysed to produce two dimensional measurements of distances, angle, etc.

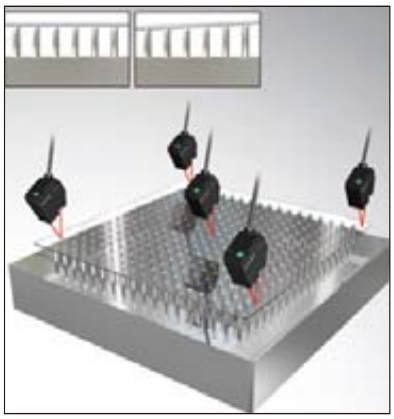


SUCCESSFUL APPLICATION

Thickness

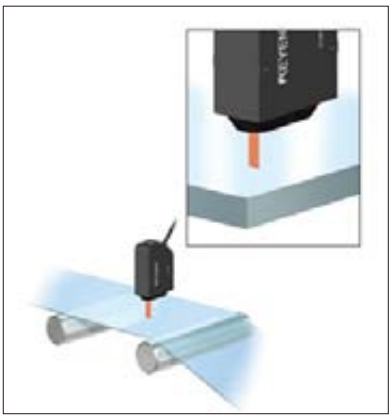
Substrate thickness measurement of solar cells

LK-G5000 Series ➡ P.10



Measurements of glass sheet thickness, warpage, and parallelism

LK-G5000 Series ➡ P.10



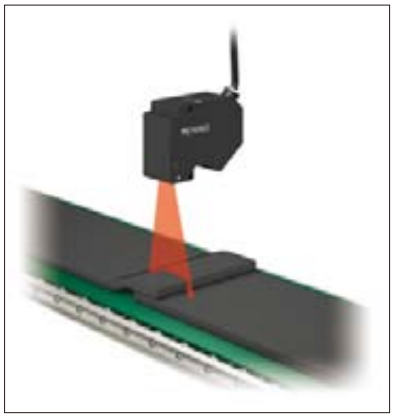
Thickness measurement of transparent film

LT-9000 Series ➡ P.48

Height and difference

HDD arm assembly adjustment

LK-G5000 Series ➡ P.10



Height and width measurement of rubber

LJ-G Series ➡ P.34

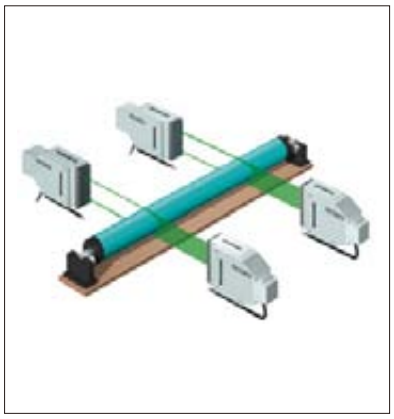
Height control of dispenser

LK-G3000 Series ➡ P.18

Width and outside diameter

Drill outer diameter measurement

TM-3000 Series ➡ P.62



Roller outer diameter measurement

LS-7000 Series ➡ P.52

Film width measurement

LS-7000 Series ➡ P.52

Swinging and vibration

Disk rotor warpage measurement

LK-G5000 Series ➡ P.10

Vibration evaluation of cellular phone

LK-G5000 Series ➡ P.10

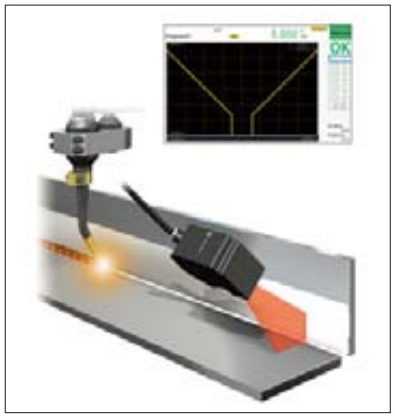
Ultrasonic welder monitoring

LK-G5000 Series ➡ P.10

Stroke and positioning

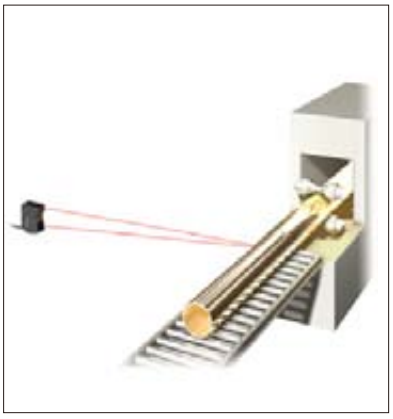
Wafer position measurement

SI Series ➡ P.40



Feedback control of a welder

LJ-G Series ➡ P.34



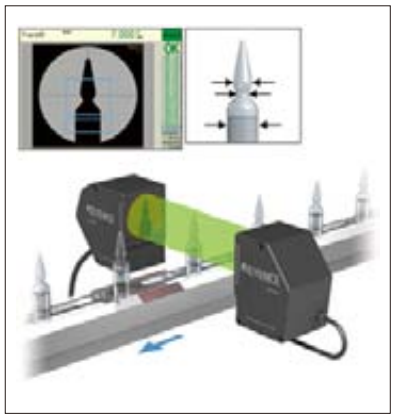
Position tracking of high temperature steel pipe

LK-G3000 Series ➡ P.18

Shape and warp

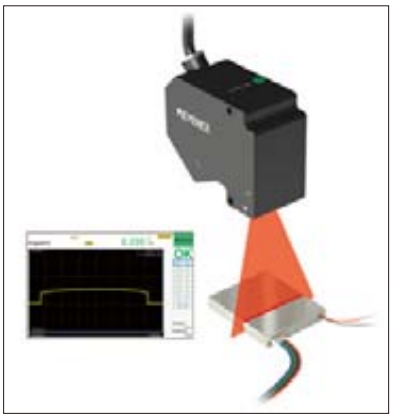
Warpage measurement of a circuit board

LK-G5000 Series ➡ P.10



Ampoule shape inspection

TM-3000 Series ➡ P.62



Thermal expansion of a lithium-ion battery.

LJ-G Series ➡ P.34

Ultra High-Speed/High-Accuracy Laser Displacement Sensor

NEW

LK-G5000 Series

CE

Features

- Fastest in the World 392 kHz
- Best linearity in its Class 0.02% of F.S.
- Connect up to 12 sensor heads/network capable

Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

www.measurecentral.com

Best specifications in class

Highest Repeatability in its Class

0.005 µm

The need to improve product quality makes high performance critical. The LK-G5000 Series provides the highest repeatability in its class and is highly capable in any application.

Highest Accuracy in its Class

±0.02 %

High-linearity enhances the LK-G5000's capabilities. By taking advantage of new technology, the series provides high performance with the high accuracy that is increasingly required.

Fastest in the World

392 kHz

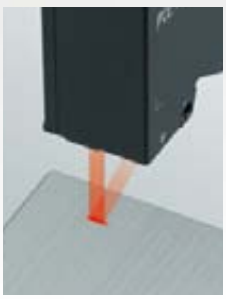
The world's fastest sampling rate not only captures displacement of moving or rotating targets, but also increases stability in all manner of applications.

Selectable variations

Wide spot type (2.5x conventional models)

Stable measurement on coarse targets

Surfaces that may appear flat, once magnified will often contain minute projections and depressions. This microscopic surface roughness can often cause measurement errors with conventional focused spot sensors. By using a sensor head with a wide beam spot, the effect of the uneven surface is averaged and stable measurements of even coarse targets are possible.

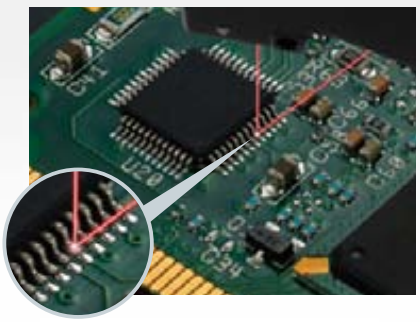


2x wider than conventional model

Focused spot type (ø25 µm)

Optimal for fine or profile measurements

The smallest spot diameter in its class of ø25 µm (LK-H022) can measure any target, from fine components to profile measurements, with the highest level of accuracy in the industry.

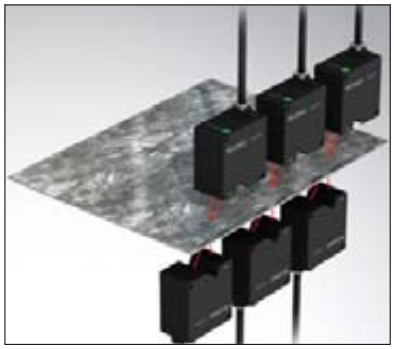


Specular reflection type

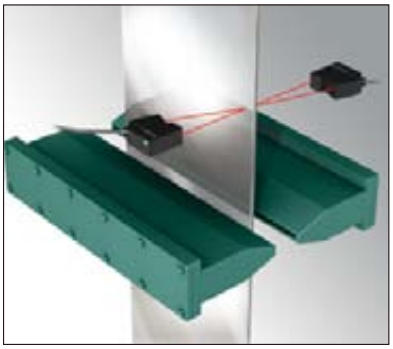
Transparent/mirror surface measurement

The LK-G5000 Series includes a group of heads specifically designed for use on highly reflective targets such as glass or other mirror surfaces. These heads are available with wide or focused beam spots and are ideally suited for high accuracy measurements on such surfaces.

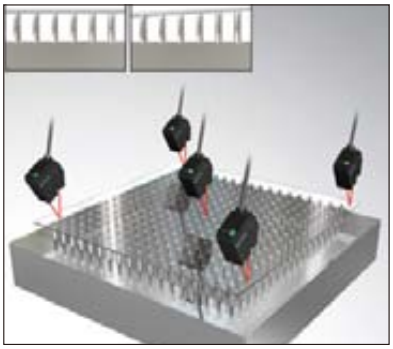
Applications



Active layer measurement of solar modules



Position control of an air knife



Measurements of glass board thickness, warpage, and parallelism

Lineup

Sensor Head

Measurement type		Reference Distance & Measurement Range	Repeatability	Model
WIDE SPOT TYPE		8±0.5 mm	0.005 µm	**LK-H008W**
		20±3 mm	0.02 µm	**LK-H027**
		50±10 mm	0.025 µm	**LK-H057**
		80±18 mm	0.1 µm	**LK-H087**
		150±40 mm	0.25 µm	**LK-H157**
FOCUSED SPOT TYPE		8±0.5 mm	0.005 µm	**LK-H008**
		20±3 mm	0.02 µm	**LK-H022**
		50±10 mm	0.025 µm	**LK-H052**
		80±18 mm	0.1 µm	**LK-H082**
		150±40 mm	0.25 µm	**LK-H152**
SPECULAR REFLECTION TYPE		8±0.5 mm	0.005 µm	**LK-H008(W)**
		16.1±2.8 mm	0.02 µm	**LK-H027K**
		46.3±5.2 mm	0.025 µm	**LK-H057K**
		76.7 -17.6 mm/+14.5 mm	0.1 µm	**LK-H087 & LK-F3**
		147.5 -39.5 mm /+24.4 mm	0.25 µm	**LK-H157 & LK-F2**

Main controller

All-in-one type
LK-G5001(P)V

Separate display type
LK-G5001(P)

Additional head unit
LK-HA100

CC-Link unit
LK-CC100

DeviceNet unit
LK-DN100

Display

Touch panel display
LK-HD1001

Compact display
LK-HD500

Configuration Software

LK-Navigator2
LK-H2

Cable

Sensor head-to-controller cable
(0.7, 2, 5, 10, 20, 30 m)
CB-Axx

Extension cable between the head and cable
(5, 10 m)
CB-AxxE

Controller-to-display connection cable
0.33 m: **OP-84427**
3 m: **OP-51655**
10 m: **OP-51656**

I/O Cable and Connector
OP-51657

Ethernet cable
OP-66843

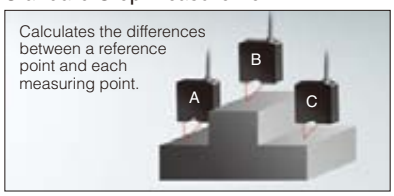
Neutral density filter

For **LK-H08x**
LK-F3
For **LK-H15x**
LK-F2

Convenient calculation functions

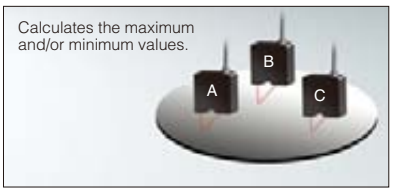
Instantly calculates values based on measurements obtained by more than one head, enabling the user to easily set complicated calculations inside the controller that were conventionally done with PLCs or PCs.

Standard Step Measurement



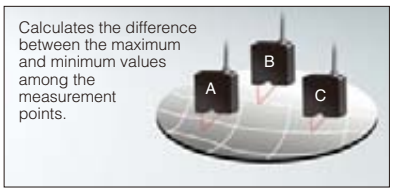
Measured value1=B-A Measured value2=B-C
Measured value3=A-C…

Maximum/Minimum Measurement



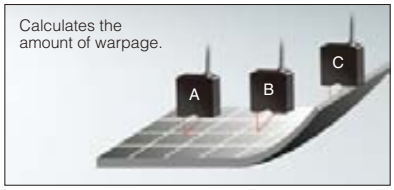
Measured value1=MAX (A,B,C...)
Measured value2=MIN (A,B,C...)

Flatness Measurement



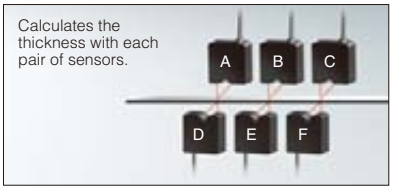
Measured value1=MAX (A,B,C...)–MIN (A,B,C...)...

Warpage Measurement



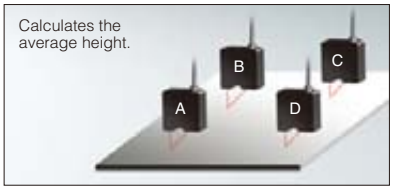
Measured value1=B-(A+C)/2…

Multi-Point Thickness Measurement



Measured value1=X+ (A+D) Measured value2=Y+ (B+E)
Measured value3=Z+ (C+F)...

Average Height Measurement



Measured value1=Ave (A,B,C,D,...)

Measurement of Velocity (m/s), Acceleration (m/s²)

The LK-G5000 Series is equipped with a function to directly measure the speed (m/s) and acceleration (m/s²) of targets. Just select the type of measurement: displacement, speed, or acceleration. Using the differential processing circuit is inside the controller, it is possible to directly output or evaluate measurements that were previously calculated externally. The LK-G5000 Series is suitable for lightweight, easily deformed, and high-temperature targets which are difficult to measure with contact accelerometers.

Example of measurement of stage movement

Displacement　Speed　Acceleration

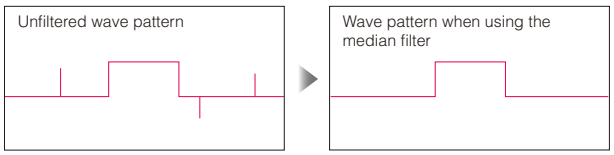
Vibration test of high-temperature-muffler

Data filter functions made easy

4 types of easy to use data processing filters are incorporated directly in the controller. The filters are user selectable for ease of use.

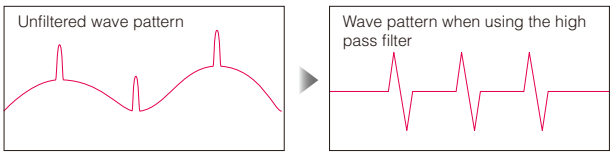
Median filter

Removes any intermittent noise in the output.



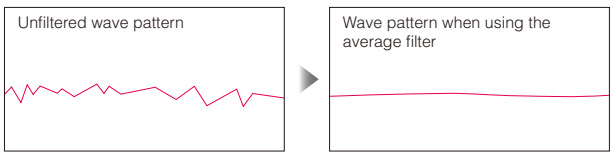
High pass filter

Captures sudden changes and removes low frequency variations.



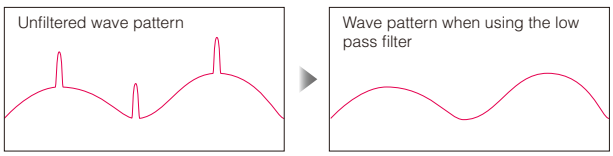
Moving average filter

Averages the measured values to reduce high the overall noise level in the measurement.



Low pass filter

Captures moderate changes while removing high frequency noise.



Specifications

Controller

Main unit/head expansion unit

Model	Single unit type	**LK-G5001V**	**LK-G5001PV**	**LK-HA100**
	Separate type	**LK-G5001/LK-HD500**	**LK-G5001P/LK-HD500**	
Designation		Main controller		Head expansion unit
Sensor head compatibility		Compatible		
No. of connectable sensor heads		2		1
Display (LK-HD500)	Minimum display unit	0.001 µm		N/A
	Display range	±999.999 µm to ±9999.99 mm (7 settings selectable)		
	Display cycle	Approx. 10 times/sec.		
Display interface	Display port	Either the display unit (LK-HD500) or dedicated touch panel (LK-HD1001) can be connected		N/A
	LED indicator	LASER ON		POWER ON, STABILITY, BRIGHT, DARK
Terminal block	Analogue voltage output	±10 V output, Output impedance: 100 Ω		
	Analogue current output	4 to 20 mA, Maximum load resistance: 350 Ω		
	No. of analogue outputs	2		1
	TIMING1 input*1	Non-voltage input	Voltage input	N/A
	RESET1 input*1	Non-voltage input	Voltage input	
	Auto-zero1 input*1			
	Laser control input*2			
	Laser remote input	Non-voltage input		
	Alarm output	NPN open-collector output	PNP open-collector output	
	General comparator output			
Expansion connector	TIMING input	Non-voltage input	Voltage input	N/A
	RESET input	Non-voltage input	Voltage input	
	Auto-zero input			
	Program switch input			
	Binary selection input			
	Alarm output	NPN open-collector output	PNP open-collector output	
	Comparator output			
	Binary output			
RS-232C interface		Baud rate: 9600 to 115200 bps Data length: 8 bits Stop bit length: 1 bit Parity: None/even/odd		N/A
USB interface		USB 2.0 Hi-Speed compliant*3		
Ethernet interface*4		100Base-TX/10Base-T		
Head expansion unit connector		Up to 10 head expansion units can be connected to one main controller		
Expansion unit connector		Either of the CC-Link unit (LK-CC100) or DeviceNet unit (LK-DN100) can be connected		N/A
Power supply	Power supply voltage	24 VDC±10%		24 VDC±10% (Supplied from the controller)
	Maximum current consumption	0.6 A or less with 1 head/3.5 A or less with 12 heads		
Environment resistance	Ambient temperature	When one or less head expansion unit is connected: 0 to 50°C When two or more head expansion units are connected: 0 to 40°C		
	Relative humidity	35 to 85%RH (No condensation)		
Weight		Approx. 600 g		Approx. 300 g

*1 This input is applied to all of the synchronised OUT.
*2 When the laser class 3B sensor head is connected, a key-operated switch must be used for the input to this terminal. The laser is emitted only when the key-operated switch is set to the ON position. (Select a key which can be removed only when it is set to the OFF position.) When the laser class 2/3R sensor head is connected, the laser turns on when this terminal is opened and turns off when it is short-circuited.
*3 When a PC supporting USB 1.1 or USB 2.0 full speed is connected, the data refresh cycle and other operations may slow down.
*4 Use the Ethernet interface only for direct connections with a PC or for local network connections with a PC or LK-G5000 Series units.

- NPN open-collector output rating: 50 mA max. (40 V max.), Residual voltage: 0.5 V max.
- PNP open-collector output rating: 50 mA max. (30 V max.), Residual voltage: 0.5 V max.
- Non-voltage input rating: ON voltage: 1 V max., OFF current: 0.6 mA max.
- Voltage input rating: Maximum input rating: 26.4 V, ON voltage: 10.2 V, OFF current: 0.6 mA
- Part of the input/output circuit of the LK-G5000 Series is internally common. Be careful that no potential difference is generated between the internally common terminals due to the potential difference between the cables/external devices. For details, refer to "Precautions on wiring" in the User's Manual.

LK-H2 (LK-Navigator2) Operating environment

CPU	Pentium III 1 GHz or higher (1.7 GHz or higher recommended)
Supported OS	Windows 7*1 Windows Vista*2 Windows XP*3 Windows 2000 Professional*4
Memory capacity	256 MB or more (1 GB or more recommended)
Display resolution	1024 x 768 pixels, 24-bit full colour or better
Available hard disk space	1 GB or more
Interface	The PC must be equipped with one of these interfaces: • USB: 2.0 Hi-Speed (USB 1.1 compatible full speed)*5 • LAN: 100BASE-TX, 10BASE-T*6

*1 Editions supported: Ultimate, Professional and Home Premium.
*2 Editions supported: Ultimate, Business, Home Premium, and Home Basic.
*3 Supports Professional SP2 and Home Edition SP2 or later.
*4 Supports SP4 or later.
*5 Does not support connection via a USB hub.
*6 Does not support connection via private LANs or routers. Use in a 1:1 or local connection.
* Windows is a registered trademark of Microsoft Corporation of America.
* Pentium is a registered trademark of Intel Corporation.

Sensor heads

Coarse target measurement (wide spot type)

Model			LK-H008W	LK-H025	LK-H027	LK-H055	LK-H057	LK-H085	LK-H087	LK-H155	LK-H157
Mounting mode			Specular reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection
Reference distance			8 mm	20 mm	20 mm	50 mm	50 mm	80 mm	80 mm	150 mm	150 mm
Measurement range*1			±0.5 mm	±3 mm	±3 mm	±10 mm	±10 mm	±18 mm	±18 mm	±40 mm	±40 mm
Light source			Red semiconductor laser								
	Wavelength		655 nm								
	Laser class	IEC 60825-1	Class 1	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2
		FDA (CDRH) Part 1040.10	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II
	Output		0.3 mW	4.8 mW	0.95 mW	4.8 mW	0.95 mW	4.8 mW	0.95 mW	4.8 mW	0.95 mW
Spot diameter (at reference distance)			20 µm × 550 µm	25 µm × 1400 µm		50 µm × 2000 µm		70 µm × 2500 µm		120 µm × 4200 µm	
Linearity*2			±0.05% of F.S. (F.S.=1 mm)	±0.02%of F.S. (F.S.= 6 mm)		±0.02% of F.S. (F.S.= 20 mm)		±0.02% of F.S. (F.S.= 36 mm)		±0.02% of F.S. (F.S.= 80 mm)	
Repeatability*3			0.005 µm (0.001 µm)	0.02 µm (0.01 µm)		0.025 µm		0.1 µm		0.25 µm	
Sampling cycle			2.55/5/10/20/50/100/200/500/1000 µs (9 steps selectable)								
Temperature fluctuation			0.02% of F.S./°C (F.S.=1 mm)	0.01% of F.S./°C (F.S.= 6 mm)		0.01% of F.S./°C (F.S.= 20 mm)		0.01% of F.S./°C (F.S.= 36 mm)		0.01% of F.S./°C (F.S.= 80 mm)	
Environment resistance	Enclosure rating		IP67								
	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.								Incandescent lamp or fluorescent lamp: 5000 lux max.
	Ambient temperature		0 to +50°C*4	0 to +50°C				0 to +50°C*4			
	Relative humidity		35 to 85%RH (No condensation)								
	Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively								
Material			Aluminium die-cast								
Weight			Approx. 240 g	Approx. 230 g		Approx. 260 g		Approx. 280 g		Approx. 300 g	

*1 Measurement range when the sampling cycle is 20 µs or more. *2 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008W) is measured in the normal measurement mode. *3 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008W) is measured at the reference distance with the number of averaging measurements set to 16384. The value in parentheses is a typical example of a measurement with the number of averaging measurements set to 65536 and the sampling cycle to 200 µs. *4 When the ambient temperature rises to 40°C or more, mount this on a metal plate before use.

Fine target measurement (focused spot type)

Model			LK-H008	LK-H020	LK-H022	LK-H050	LK-H052	LK-H080	LK-H082	LK-H150	LK-H152
Mounting mode			Specular reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection
Reference distance			8 mm	20 mm	20 mm	50 mm	50 mm	80 mm	80 mm	150 mm	150 mm
Measurement range*1			±0.5 mm	±3 mm	±3 mm	±10 mm	±10 mm	±18 mm	±18 mm	±40 mm	±40 mm
Light source			Red semiconductor laser								
	Wavelength		655 nm								
	Laser class	IEC 60825-1	Class 1	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2
		FDA (CDRH) Part 1040.10	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II
	Output		0.3 mW	4.8 mW	0.95 mW	4.8 mW	0.95 mW	4.8 mW	0.95 mW	4.8 mW	0.95 mW
Spot diameter (at reference distance)			ø20 µm	ø25 µm		ø50 µm		ø70 µm		ø120 µm	
Linearity*2			±0.05% of F.S. (F.S.=1 mm)	±0.02% of F.S. (F.S.= 6 mm)		±0.02% of F.S. (F.S.= 20 mm)		±0.02% of F.S. (F.S.= 36 mm)		±0.02% of F.S. (F.S.= 80 mm)	
Repeatability*3			0.005 µm (0.001 µm)	0.02 µm (0.01 µm)		0.025 µm		0.1 µm		0.25 µm	
Sampling cycle			2.55/5/10/20/50/100/200/500/1000 µs (9 steps selectable)								
Temperature fluctuation			0.02% of F.S./°C (F.S.=1 mm)	0.01% of F.S./°C (F.S.= 6 mm)		0.01% of F.S./°C (F.S.= 20 mm)		0.01% of F.S./°C (F.S.= 36 mm)		0.01% of F.S./°C (F.S.= 80 mm)	
Environment resistance	Enclosure rating		IP67								
	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.								Incandescent lamp or fluorescent lamp: 5000 lux max.
	Ambient temperature		0 to +50°C*4	0 to +50°C				0 to +50°C*4			
	Relative humidity		35 to 85%RH (No condensation)								
	Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively								
Material			Aluminium die-cast								
Weight			Approx. 240 g	Approx. 230 g		Approx. 260 g		Approx. 280 g		Approx. 300 g	

*1 Measurement range when the sampling cycle is 20 µs or more. *2 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008) is measured in the normal measurement mode. *3 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008) is measured at the reference distance with the number of averaging measurements set to 16384. The value in parentheses is a typical example of a measurement with the number of averaging measurements set to 65536 and the sampling cycle to 200 µs. *4 When the ambient temperature rises to 40°C or more, mount this on a metal plate before use.

Transparent/mirror target measurement (specular reflection type)

Model			LK-H008	LK-H008W	LK-H022K	LK-H027K	LK-H052K	LK-H057K	LK-H082	LK-H087	LK-H152	LK-H157
Mounting mode			Specular reflection	Specular reflection	Specular reflection	Specular reflection	Specular reflection	Specular reflection	Specular reflection*4		Specular reflection*4	
Reference distance			8 mm	8 mm	16.1 mm	16.1 mm	46.3 mm	46.3 mm	76.7 mm		147.5 mm	
Measurement range*1			±0.5 mm	±0.5 mm	±2.8 mm	±2.8 mm	±5.2 mm	±5.2 mm	–17.6 mm to +14.5 mm		–39.5 mm to +24.4 mm	
Light source			Red semiconductor laser									
	Wavelength		655 nm									
	Laser class	IEC 60825-1	Class 1		Class 2							
		FDA (CDRH) Part 1040.10	Class II									
	Output		0.3 mW		0.95 mW							
Spot diameter (at reference distance)			ø20µm	20 µm×550 µm	ø25 µm	25 µm×1400 µm	ø50 µm	50 µm×2000 µm	ø70 µm	70 µm × 2500 µm	ø120 µm	120 µm × 4200 µm
Linearity*2			±0.05% of F.S. (F.S.= 1 mm)		±0.02% of F.S. (F.S.= 6 mm)		±0.02% of F.S. (F.S.= 20 mm)		±0.02% of F.S. (F.S.= 36 mm)*6		±0.02% of F.S. (F.S.= 80 mm)*6	
Repeatability*3			0.005 µm (0.001 µm)		0.02 µm (0.01 µm)		0.025 µm		0.1 µm		0.25 µm	
Sampling cycle			2.55/5/10/20/50/100/200/500/1000 µs (9 steps selectable)									
Temperature fluctuation			0.02% of F.S./°C (F.S.=1 mm)		0.01% of F.S./°C (F.S.= 6 mm)		0.01% of F.S. (F.S.= 20 mm)		0.01% of F.S. (F.S.= 36 mm)		0.01% of F.S. (F.S.= 80 mm)	
Environment resistance	Enclosure rating		IP67									
	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.								Incandescent lamp or fluorescent lamp: 5000 lux max.	
	Ambient temperature		0 to +50°C*5		0 to +50°C				0 to +50°C*5			
	Relative humidity		35 to 85% RH (No condensation)									
	Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively									
Material			Aluminium die-cast									
Weight			Approx. 240 g		Approx. 230 g		Approx. 260 g		Approx. 280 g		Approx. 300 g	

*1 Measurement range when the sampling cycle is 20 µs or more. *2 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008/LK-H008W) is measured in the normal measurement mode. *3 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008/LK-H008W) is measured at the reference distance with the number of averaging measurements set to 16384. The value in parentheses is a typical example of a measurement with the number of averaging measurements set to 65536 and the sampling cycle to 200 µs. *4 Use one of the following dark filters when measuring a transparent or mirror surface object: LK-H082/LK-H087: LK-F3, LK-H152/LK-H157: LK-F2 *5 When the ambient temperature rises to 40°C or more, mount this on a metal plate before use.
*6 Value measured at the event of diffuse reflection installation. Please contact us for the case of regular reflection installation.

LK-CC100 (CC-Link unit)

Model		LK-CC100
Designation		CC-Link communication unit dedicated to LK-G5000 Series
Network connection	Supported CCLink*1 version	Ver. 1.10 (Extended cyclic setting: Single) Ver. 2.00 (Extended cyclic setting: Double or more)*2
	Master unit	CLPA-certified master unit (CC-Link Ver. 2.00/Ver. 1.10)
	No. of occupied stations	1 to 4
	Communication speed	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
	Connection cable	Dedicated CC-Link cable supporting Ver. 1.10 (Shielded 3-core twisted-pair cable: OP-79426, OP-79427)
	Maximum total cable extension length	156 kbps: 1200 m, 625 kbps: 900 m, 2.5 Mbps: 400 m, 5 Mbps: 160 m, 10 Mbps: 100 m
	Station type	Remote device station
Environment resistance	Ambient temperature	When one or less head expansion unit is connected: 0 to 50°C. When two or more head expansion units are connected: 0 to 40°C.
	Relative humidity	35 to 85 %RH (No condensation)
Rated voltage		24 VDC±10 % (supplied from controller)
Current consumption		200 mA max.
Weight		Approx. 300 g

*1 CC-Link is a registered trademark of Mitsubishi Electric Corporation.
*2 The LK-G5000 Series supports the "extended cyclic transmission" and "station-to-station cable length relaxation" of CC-Link Ver. 2.00.

LK-DN100 (DeviceNet unit)

Model		LK-DN100
Designation		DeviceNet communication unit dedicated to LK-G5000 Series
Network connection	Communication protocol	DeviceNet*1 compliant
	Master unit	ODVA-certified master unit
	Transmission speed	500 kbps, 250 kbps, 125 kbps
	Device type	Generic
	Transmission medium	Dedicated 5 cables (2 signal cables, 2 power supply cables, 1 shielding cable)
	Maximum trunk line cable length	Thick cable: 500 m (at transmission speed of 125 kbps)/250 m (at 250 kbps)/ 125 m (at 500 kbps) Thin cable: 100 m (at all transmission speed settings)
	Communication type	I/O communication (Poll) Explicit message communication
	Power supply	11 VDC to 25 VDC
	Current consumption	10 mA max. (when network power supply 24 V is applied)
Environment resistance	Ambient temperature	When one or less head expansion unit is connected: 0 to 50°C. When two or more head expansion units are connected: 0 to 40°C.
	Relative humidity	35 to 85%RH (No condensation)
Rated voltage		24 VDC ±10% (supplied from controller)
Current consumption		200 mA max.
Weight		Approx. 300 g

*1 DeviceNet is a registered trademark of ODVA (Open DeviceNet Vendor Association).

LK-G5000 Series Touch Panel Display

Model		LK-HD1001
Name		LK-G5000 Series Touch Panel Display
Display panel	Display elements	TFT colour LCD
	Display colour	32,768 colours
	Pixels (W x H pixels)	640 × 480
	Display area (W x H mm)	170.9 × 128.2
	Service life (normal temperature and humidity)	Approx. 50,000 hours
Backlight lamp	Type	White LED
	Service life	Approx. 50,000 hours
Touch switch	Number of switches	40 x 30 per 1 image
	Mode	Matrix resistance membrane mode
	Operating force	0.98N or less
	Service life	More than one million times
Communication function		Available only with the LK-G5000 Series
Structure		Panel built-in type, IP65f equivalent dust-proof, waterjet-proof on only front panel
Operating environment		Limit dust and corrosive gas
Ambient temperature		0 to 50°C
Ambient humidity		35 to 85%RH (no condensation) When the ambient temperature is higher than 40°C, limit the absolute humidity to 85%RH at 40°C.
Storage temperature		-10 to +60°C (no freezing)
Storage humidity		35 to 85%RH (no condensation) When the ambient temperature is higher than 40°C, limit the absolute humidity to 85%RH at 40°C.
Vibration resistance		10 to 57 Hz, 0.3 mm double amplitude/57 to 500 Hz, 2G, 3 hours in each direction (X, Y, and Z)
Weight		Approx. 1150 g
Rated voltage		24 VDC ±10%
Current consumption		1 A or less

Head-to-controller cable

Model	CB-A07	CB-A2	CB-A5	CB-A10	CB-A20	CB-A30
Cable length	0.7 m	2 m	5 m	10 m	20 m	30 m
Weight	Approx. 100 g	Approx. 200 g	Approx. 400 g	Approx. 750 g	Approx. 1400 g	Approx. 2000 g

Extension cable between the head and cable

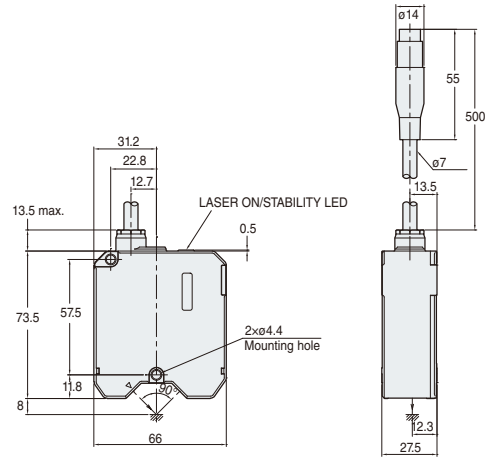
Model	CB-A5E	CB-A10E
Cable length	5 m	10 m
Weight	Approx. 400 g	Approx. 750 g

Dimensions

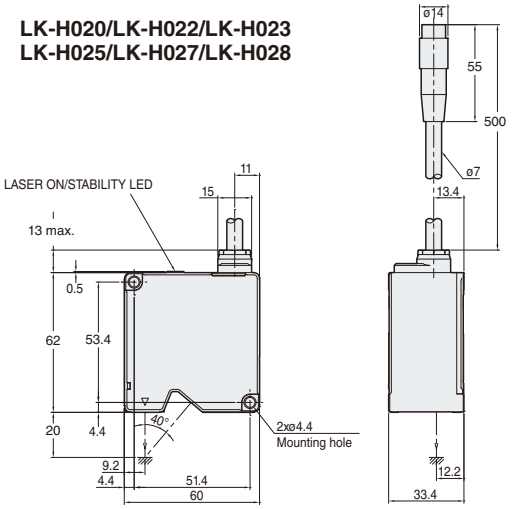
Unit: mm

Head

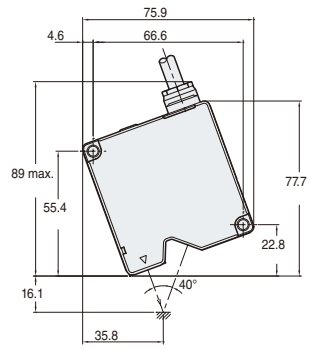
LK-H008/LK-H008W



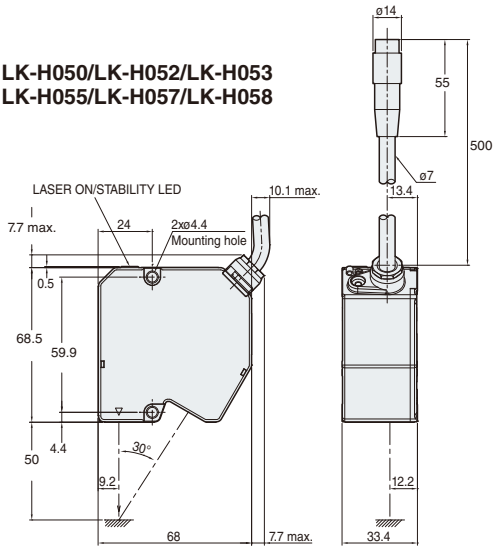
LK-H020/LK-H022/LK-H023
LK-H025/LK-H027/LK-H028



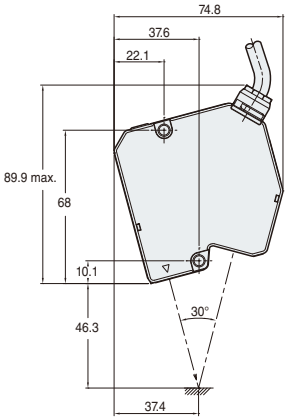
LK-H022K/LK-H027K



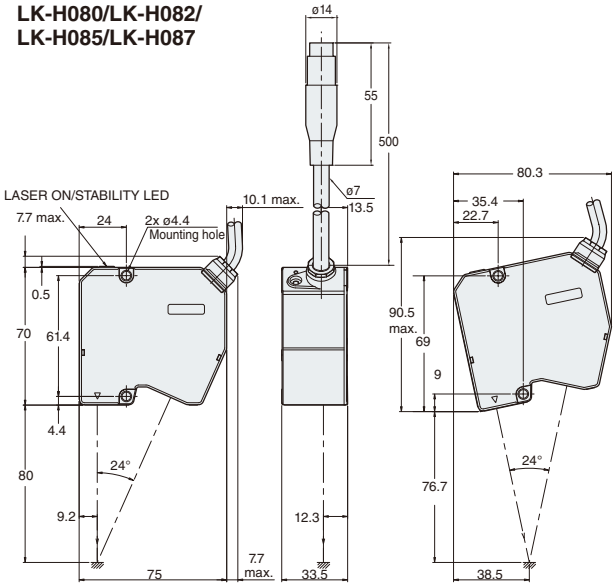
LK-H050/LK-H052/LK-H053
LK-H055/LK-H057/LK-H058



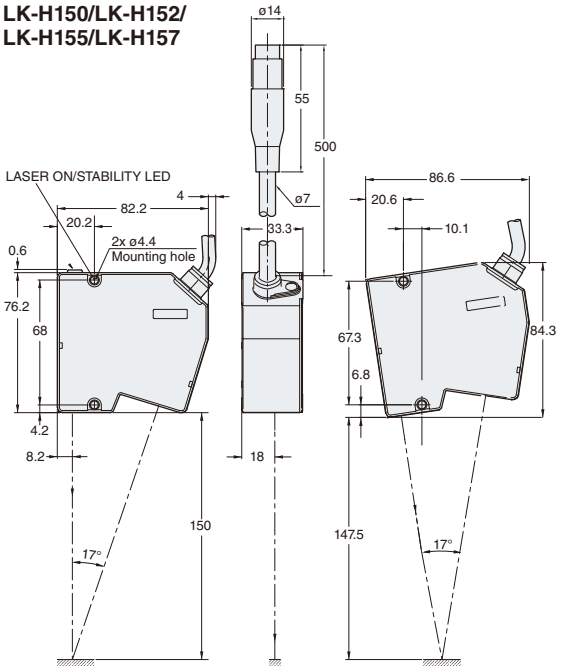
LK-H052K/LK-H057K



LK-H080/LK-H082/
LK-H085/LK-H087



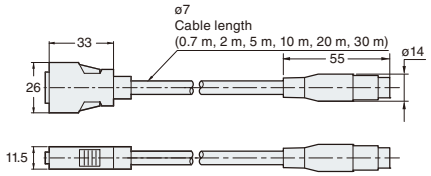
LK-H150/LK-H152/
LK-H155/LK-H157



Extension cable

[Cable between the head and controller]

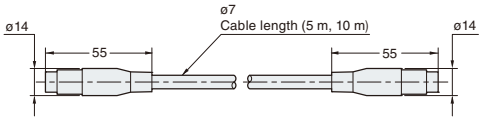
CB-A07/CB-A2/CB-A5/CB-A10/CB-A20/CB-A30



Extension cable

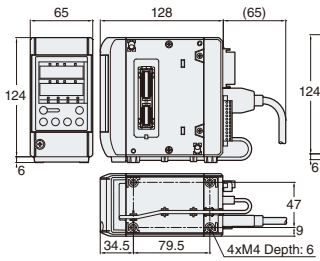
[Cable between the head and cable]

CB-A5E/CB-A10E

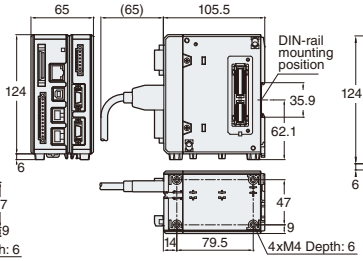


Controller

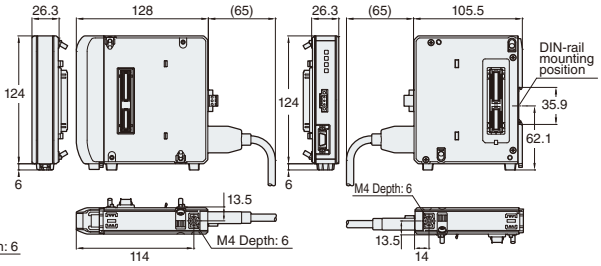
LK-G5001(P)V



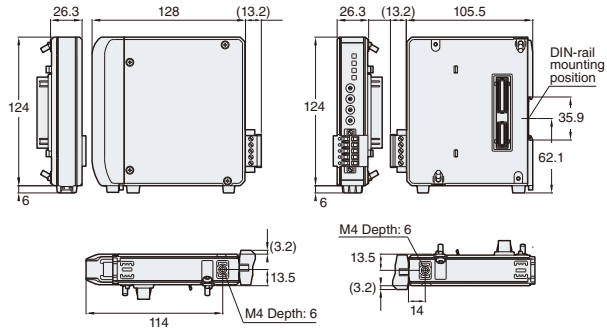
LK-G5001(P)



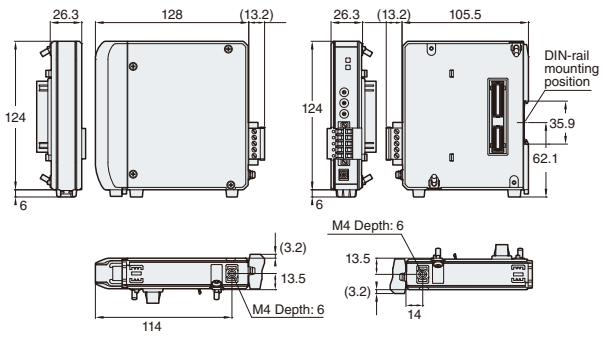
LK-HA100



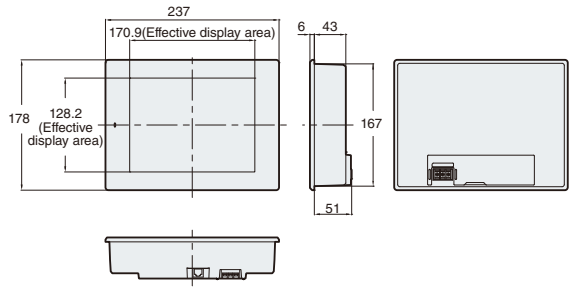
LK-CC100



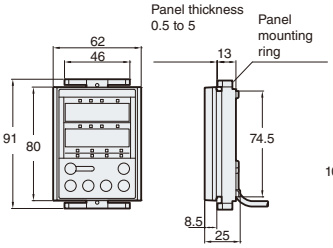
LK-DN100



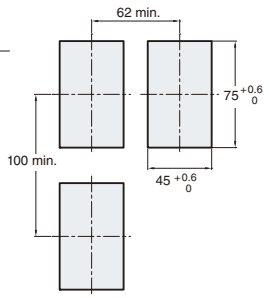
LK-HD1001 Touch Panel Display



LK-HD500



PANEL CUTOUT DIMENSIONS



Warning

The LK-G Series conforms to the following FDA and IEC standards:

Model	LK-H008/ LK-H008W	LK-H022/H022K/H027/H027K/H052/H052K/ LK-H057/H057K/H082/H087/H152/H157	LK-H020/H025/H050/H055/ LK-H080/H085/H150/H155
FDA (CDRH) Part 1040.10	Class II Laser Product	Class II Laser Product	Class IIIa Laser Product
IEC60825-1	Class 1 Laser Product	Class 2 Laser Product	Class 3R Laser Product

High-Speed, High-Accuracy CCD Laser Displacement Sensor

LK-G3000 Series

CE

Features

- Sampling rate of 50 kHz
- Linearity of ±0.05% of F.S.
- Repeatability down to 0.01 µm
- Can measure diffuse, specular, transparent, or translucent targets
- Wide beam spot models are available

Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

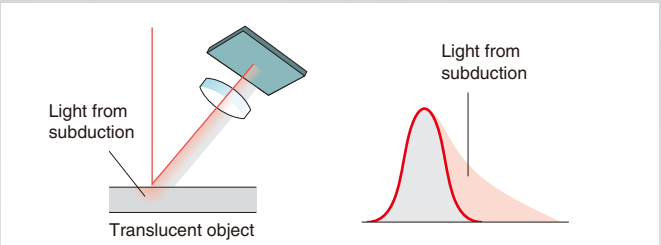
www.measurecentral.com

The newly-developed algorithms support various applications

RPD* ALGORITHM

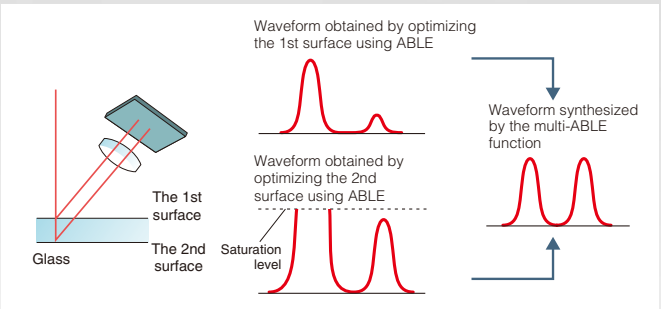
Laser light tends to react differently with translucent targets, generating diffused reflections, which result in gradual broadening of the received light waveform. The RPD algorithm cancels the influence of the broadened waveform and detects the true peak (Real Peak).

* RPD=Real Peak Detect



MULTI-ABLE CONTROL

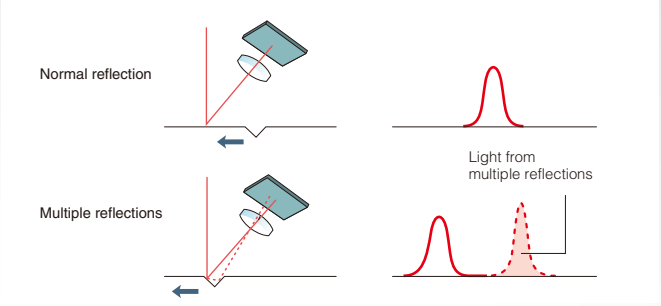
The reflected light at each layer is sensed to optimize the intensity of laser light. Highly accurate thickness measurements are enabled by optimizing the optical setting for each layer.


Waveform obtained by optimizing the 1st surface using ABLE
Waveform synthesized by the multi-ABLE function
Waveform obtained by optimizing the 2nd surface using ABLE
The 1st surface
The 2nd surface
Glass
Saturation level

MRC* ALGORITHM

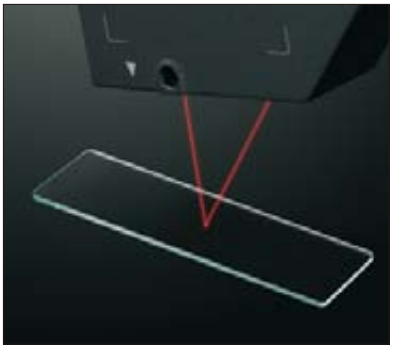
When two or more peaks are generated by multiple reflections, the algorithm compares the waveforms to the most recent received-light waveform and determines the one with the most similarity to the correct waveform.

* MRC=Multiple Reflection Cancel

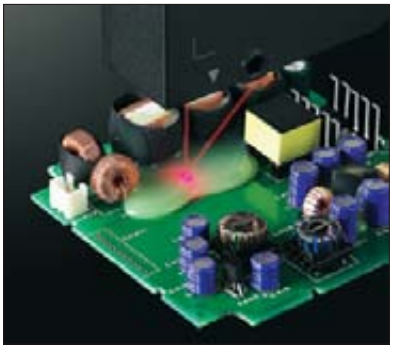


Applications

Detecting the runout of a HDD



Thickness measurement of a glass plate



Height measurement of PCB resin

Lineup

Type		Model	Laser Class	Measuring range	Repeatability	Spot diameter
Compact/ Super Precision	Small spot	**LK-G10**	Class II (FDA) Class 1 (IEC)	10 mm Measuring range 10 ±1 mm	0.01 µm	ø20 µm
	Wide beam	**LK-G15**				20 x 500 µm
High Accuracy	Small spot	**LK-G32**	Class II (FDA) Class 2 (IEC)	25 mm 30 mm 35 mm Measuring range 30 ±5 mm	0.05 µm	ø30 µm
	Wide beam	**LK-G37**				30 x 850 µm
Multi-purpose	Small spot	**LK-G82**		65 mm 80 mm 95 mm Measuring range 80 ±15 mm	0.2 µm	ø70 µm
	Wide beam	**LK-G87**				70 x 1100 µm
Long Distance	Small spot	**LK-G152**		110 mm 150 mm 190 mm Measuring range 150 ±40 mm	0.5 µm	ø120 µm
	Wide beam	**LK-G157**				120 x 1700 µm
High-speed Long Distance	Small spot	**LK-G402**		300 mm 400 mm 500 mm Measuring range 400 ±100 mm	2 µm	ø290 µm
	Wide beam	**LK-G407**				290 x 8300 µm
Ultra Long Distance	Small spot	**LK-G502**		250 mm 500 mm 1000 mm Measuring range 500 -250/+500 mm	2 µm	ø300 µm
	Wide beam	**LK-G507**				300 x 9500 µm

Specifications

Sensor heads

Model		LK-G10/G15	LK-G32/G37		LK-G82/G87		LK-G152/G157	
Mounting mode		–	Diffused reflection	Specular reflection	Diffuse reflection	Specular reflection	Diffuse reflection	Specular reflection
Reference distance		10 mm	30 mm	23.5 mm	80 mm	75.2 mm	150 mm	147.5 mm
Measuring range *1		±1 mm	±5 mm	±4.5 mm	±15 mm	±14 mm	±40 mm	±39 mm
Light source		Red semiconductor laser						
	Wavelength	655 nm (visible light)						
	Laser Class	Class II (FDA (CDRH) Part 1040.10), Class 1 (IEC 60825-1)	Class II (FDA (CDRH) Part 1040.10), Class 2 (IEC 60825-1)					
	Output	0.3 mW	0.95 mW					
Spot diameter (at reference distance)		Approx. 20 x 500 µm (G15), Approx. ø20 µm (G10)	Approx. 30 x 850 µm (G37), Approx. ø30 µm (G32)		Approx. 70 x 1100 µm (G87), Approx. ø70 µm (G82)		Approx. 120 x 1700 µm (G157), Approx. ø120 µm (G152)	
Linearity *2		±0.03% of F.S. (F.S.= ±1 mm)	±0.05% of F.S. (F.S.= ±5 mm)		±0.05% of F.S. (F.S.= ±15 mm)		±0.05% of F.S. (F.S.= ±40 mm)	
Repeatability *3		0.02 µm (0.01 µm)	0.05 µm *4		0.2 µm *4		0.5 µm *4	
Sampling time		20/50/100/200/500/1000 µs (Selectable from 6 levels)						
LED display		Near the centre of the measurement: Green lights, Within the measurement area: Orange lights, Outside the measurement area: Orange flashing						
Temperature characteristics		0.01% of F.S./°C (F.S.= ±1 mm)	0.01% of F.S./°C (F.S.= ±5 mm)		0.01% of F.S./°C (F.S.= ±15 mm)		0.01% of F.S./°C (F.S.= ±40 mm)	
Enclosure rating		IP67 (IEC60529)						
Ambient luminance		Incandescent lamp or fluorescent lamp: 10000 lux max.					Incandescent lamp or fluorescent lamp: 5000 lux max.	
Ambient temperature		0 to 50°C						
Relative humidity		35 to 85%, No condensation						
Vibration resistance		10 to 55 Hz, double amplitude 1.5 mm; two hours in each direction of X, Y, and Z						
Material		Aluminium die-cast						
Weight (including the cable)		Approx. 190 g	Approx. 280 g		Approx. 380 g		Approx. 290 g	

*1 The value is obtained by measuring KEYENCE's standard target (ceramic).
LK-G10/G15: When the sampling rate is 20 µs, the value becomes +0.37 (FAR side) to -1 mm (NEAR side).
LK-G32/G37: When the sampling rate is 20 µs, the value becomes +1.8 (FAR side) to -5 mm (NEAR side) for diffuse reflection, and +1.6 (FAR side) to -4.5 mm (NEAR side) for specular reflection.
LK-G82/G87: When the sampling rate is 20 µs, the value becomes -9 (NEAR side) to -15 mm (NEAR side) for diffuse reflection, and -8.7 (NEAR side) to -14 mm (NEAR side) for specular reflection.
LK-G152/G157: When the sampling rate is 20 µs, the value becomes -22 (NEAR side) to -40 mm (NEAR side) for diffuse reflection, and -22 (NEAR side) to -39 mm (NEAR side) for specular reflection.
*2 The value is obtained by measuring KEYENCE's standard target (ceramic) with the Standard mode.
*3 The value is obtained by measuring KEYENCE's standard(SUS) with 4096 times of averaging at the reference distance. The value in parenthesis is the typical repeatability obtained by measuring the target with 16384.
*4 Consult your nearest KEYENCE representative for the Class IIIa type with increased repeatability.

Model		LK-G402/G407		LK-G502/G507	
Mounting mode		Diffused reflection	Specular reflection	Diffused reflection	Specular reflection
Reference distance		400 mm	398 mm	500 mm	497.5 mm
Measuring range*1		±100 mm	±99 mm	-250 to +500 mm	-249 to +498 mm
Light source		Red semiconductor laser			
	Wavelength	655 nm (visible light)			
	Laser Class	Class II (FDA (CDRH) Part 1040.10), Class 2 (IEC 60825-1)			
	Output	0.95 mW			
Spot diameter (at reference distance)		Approx. 290 x 8300 µm (G407) Approx. ø290 µm (G402)		Approx. 300 x 9500 µm (G507) Approx. ø300 µm (G502)	
Linearity *2		±0.05% of F.S.(F.S.= ±100 mm)		±0.05% of F.S. (±250 µm) *4*5 -250 to +250 mm <high-accuracy range> ±0.02% of F.S. (±100 µm) -250 to -50 mm <long range> ±0.1% of F.S. (±500 µm) -250 to +500 mm (F.S. = ±250 mm)	
Repeatability *3		2 µm			
Sampling time		20/50/100/200/500/1000 µs (Selectable from 6 levels)			
LED display		Near the centre of the measurement: Green lights Within the measurement area: Orange lights Outside the measurement area: Orange flashing			
Temperature characteristics		0.01% of F.S./°C (F.S.= ±100 mm)		0.01% of F.S./°C (F.S.= ±250 mm)	
Enclosure rating		IP67 (IEC60529)			
Ambient light		Incandescent lamp or fluorescent lamp: 5000 lux max.			
Ambient temperature		0 to 50°C			
Relative humidity		35 to 85%, No condensation			
Vibrations resistance		10 to 55 Hz, double amplitude 1.5 mm; two hours in each direction of X, Y, and Z			
Material		Aluminium die-cast			
Weight (including the cable)		Approx. 380 g			

*1 The value is obtained by measuring KEYENCE's standard target (ceramic).
<LK-G407/G402>
When the sampling rate is 20 µs, the value becomes -70 mm (NEAR side) to -100 mm (NEAR side) for diffuse reflection.
When the sampling rate is 20 µs, the value becomes -70 mm (NEAR side) to -99 mm (NEAR side) for specular reflection.
<LK-G507/G502>
When the sampling rate is 20 µs, the value becomes -230 mm (NEAR side) to -250 mm (NEAR side) for diffuse reflection.
When the sampling rate is 20 µs, the value becomes -230 mm (NEAR side) to -249 mm (NEAR side) for specular reflection.
When the sampling rate is 50 µs, the value becomes -125 mm (NEAR side) to -250 mm (NEAR side) for diffuse reflection.
When the sampling rate is 50 µs, the value becomes -125 mm (NEAR side) to -249 mm (NEAR side) for specular reflection.
*2 The value is obtained by measuring KEYENCE's standard target (ceramic) with the Standard mode.
*3 The value is obtained by measuring KEYENCE's standard (SUS) with 4096 times of averaging at the reference distance.
*4 All are calculated at F.S. = (±250 mm).
*5 "High accuracy range" and "long range" refer to the linearity when those ranges are used.

Controller

Type			All-in-one model	Separate monitor model *1
Model		NPN	**LK-G3001V**	**LK-G3001/LK-GD500**
		PNP	**LK-G3001PV**	**LK-G3001P/LK-GD500**
Display	Head compatibility		All LK-G sensor heads are compatible	
	Number of connectable sensors		Maximum of 2 units	
	Minimum display unit		0.01 µm	
	Display range		±9999.99 mm to ±9999.99 µm (Selectable from six levels)	
	Refresh rate		10 times/sec	
Terminal block	Analogue voltage output		±10 V x 2 outputs, output impedance: 100 Ω	
	Analogue current output		4 to 20 mA x 2 outputs, maximum load resistance: 350 Ω	
	Timing/Reset/Auto-zero input		For OUT1, non-voltage or voltage input *3	
	Laser remote interlock input		Non-voltage input *3	
	Comparator output		For OUT1, NPN or PNP open-collector output *2	
	Alarm output		For OUT1, NPN or PNP open-collector output *3 (N.C.)	
Expansion connector	Timing/Reset/Auto-zero input		For OUT2, non-voltage or voltage input *3	
	Program switching input		Non-voltage or voltage input *3 x 3 inputs	
	Laser-Off input		For Head A/Head B, non-voltage or voltage input *3	
	Comparator output		For OUT2, NPN or PNP open-collector output *2	
	Alarm output		For OUT2, NPN or PNP open-collector output *2(N.C.)	
	Binary	Binary output	Measured data output (21 bits), OUT1/OUT2 selectable, NPN or PNP open-collector output *2	
		Strobe output	NPN or PNP open-collector output *2	
		Binary selector output	NPN or PNP open-collector output *2	
		Binary selector input	Non-voltage or voltage input *3	
RS-232C interface			Measured data output and control input/output (Maximum baud rate: 115200 bps, selectable)	
USB interface			In conformity with USB Revision 2.0 Full speed (USB1.1 compatible)	
Major functions			2 OUT simultaneous measurement, Operation, Averaging, Filter, Calibration, Measurement, AUTO ZERO, Sampling frequency setting, Mutual interference prevention, Data storage, 8-program memory, ECO mode, ABLE setting, Target setting, ABLE tuning, Selection of measurement surface of transparent target, Statistics processing, Connection of setting support software, Selectable head-mounting, etc.	
Power supply voltage			24 VDC±10%, Ripple: 10% (P to P) or less	
Current consumption			500 mA or less with 1 head/600 mA or less with 2 heads	
Ambient temperature			0 to 50°C	
Relative humidity			35 to 85%, No condensation	
Weight			Approx. 480 g (LK-G3001V/G3001PV), Approx. 370 g (LK-G3001/G3001P), Approx. 60 g (LK-GD500)	

*1 LK-G3001(P) can be operated singly. The measured value display and setting modifications can be performed on the display panel (LK-GD500) or via the setting support software (LK-H1W).
*2 The rating of the NPN open-collector: 50 mA max. (40 V max.), residual voltage of 0.5 V max. The rating of the PNP open collector: 50 mA max. (30 V max.), residual voltage of 0.5 V max.
*3 (NPN model) The rating of non-voltage input: 1 V or less ON voltage, 0.6 mA or less OFF current. (PNP model) The rating of voltage input: 10.2 V or more ON voltage (26.4 V max.) 0.6 mA or less OFF current.

Hardware environment

Item	Hardware requirements
CPU	Pentium III, 400 MHz or higher
Supported OS	Windows 7*1/Windows Vista*2 Windows XP*3/Windows 2000 Professional
Memory capacity	64 Mbytes or more
Display	800 x 600 pixels, 256 colours or more
Hard disk space	10 Mbytes or more
Interface*4	RS-232C (serial port) or USB2.0/1.1*5 must be installed.

*1 Home Premium, Professional and Ultimate editions are supported.
*2 Ultimate, Business, Home Premium, Home Basic editions are supported. For Windows Vista, Ver. 1.5 and later versions are supported.
*3 Professional and Home edition are supported.
*4 Select one for communication. Multiple interfaces cannot be used for communication at the same time.
*5 Operations are not guaranteed when connected through a USB hub. Use under an environment that exceeds the recommended environment of the your OS.
• Windows is a registered trademark of Microsoft Corporation of America.
• Pentium is a registered trademark of Intel Corporation.

Extension cable (Cable between the head and controller)

Model	LK-GC2	LK-GC5	LK-GC10	LK-GC20	LK-GC30
Cable length	2 m	5 m	10 m	20 m	30 m
Weight	Approx. 200 g	Approx. 400 g	Approx. 750 g	Approx. 1400 g	Approx. 2000 g

Extension cable (Cable for display panel)

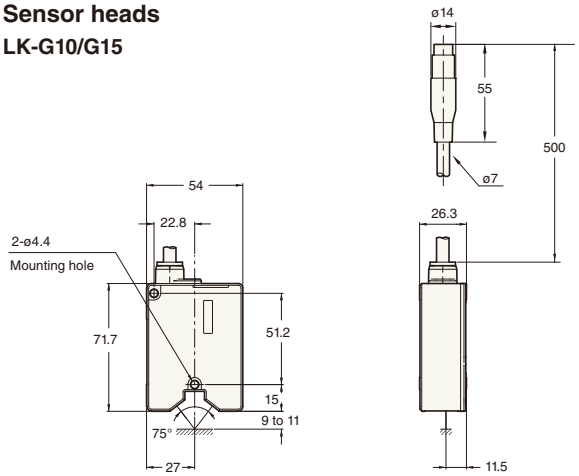
Model	OP-51654	OP-51655	OP-51656
Cable length	0.3 m	3 m	10 m

Dimensions

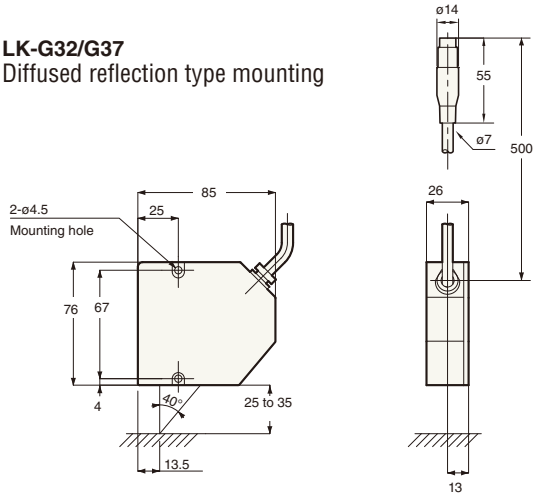
Unit: mm

Sensor heads

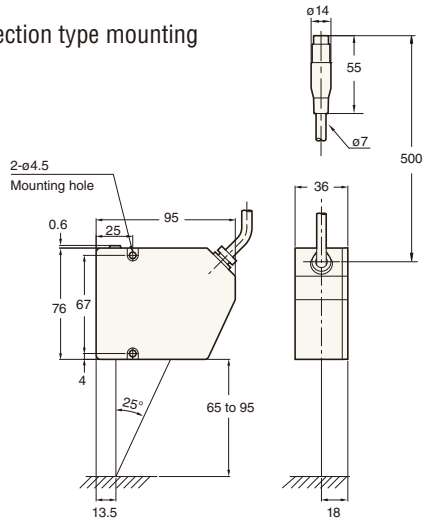
LK-G10/G15



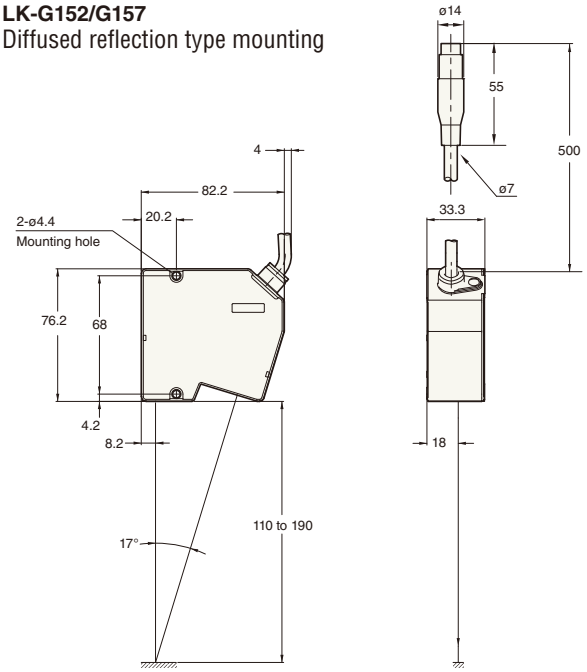
LK-G32/G37
Diffused reflection type mounting



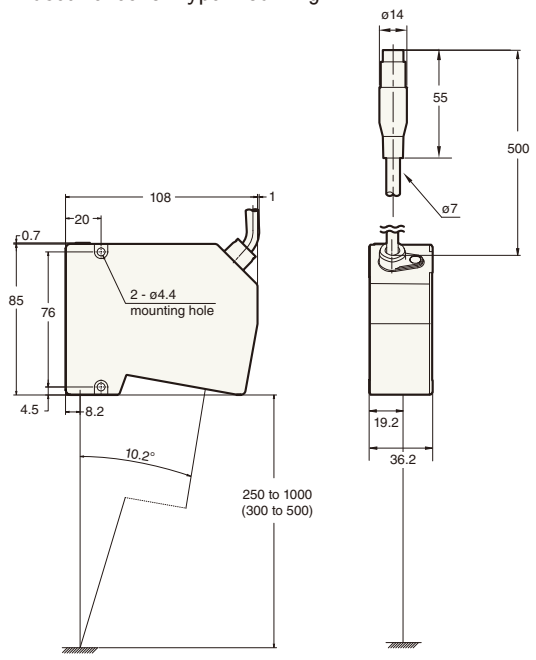
LK-G82/G87
Diffused reflection type mounting



LK-G152/G157
Diffused reflection type mounting

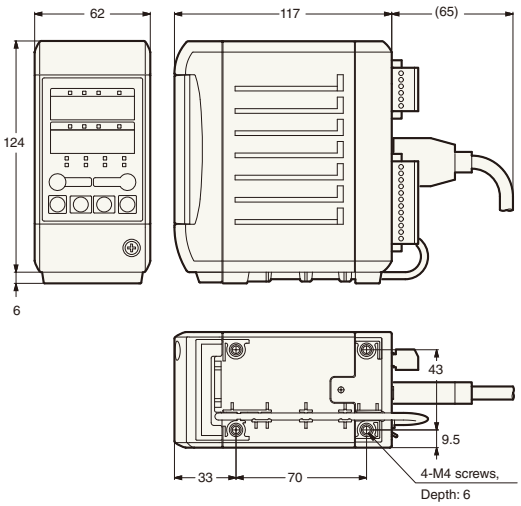


LK-G402/G407/G502/G507
Data in ( ) applies to **LK-G407/G402**
Diffused reflection type mounting

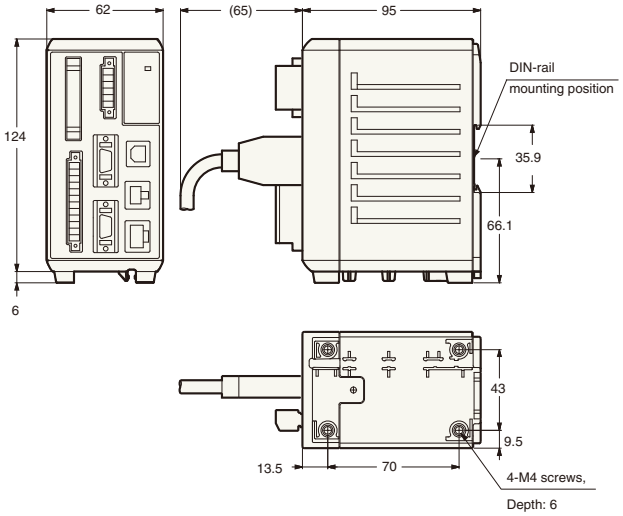


Controllers

LK-G3001V/LK-G3001PV

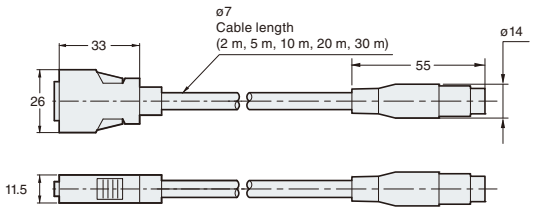


LK-G3001/LK-G3001P



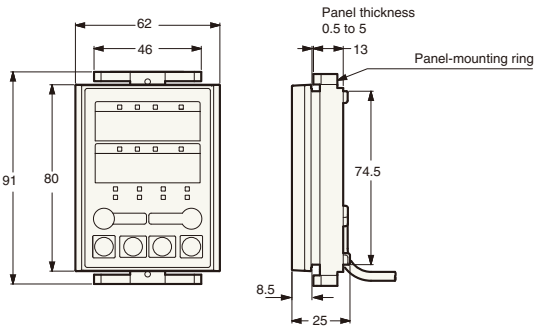
Cable between the head and controller

LK-GC2/LK-GC5/LK-GC10/LK-GC20/LK-GC30

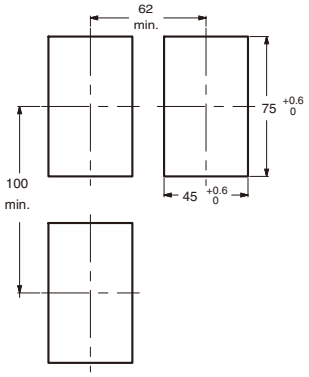


Display panel

LK-GD500



Panel cutout dimensions



CCD Laser Displacement Sensors

LK Series

CE

Features

- Linearity of ±0.1% of F.S.
- Repeatability of 1 µm
- 30 µm diameter beam spot
- Ultra long measuring distance up to 750 mm
- Measurement unaffected by colour, surface texture or stray light

Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

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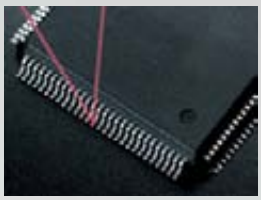
Measurement of various target surfaces

The LFTC circuit enables measurement of multicoloured or patterned targets. Low reflectance targets, such as black rubber, can be measured without additional adjustment.

Laser beam spot of 30 µm diameter

KEYENCE's unique optical system minimizes lens aberration to give the LK-031 a minimum spot diameter of 30 µm. This enables the surface contour of a target to be accurately measured.



Lineup

Type	Compact/high-accuracy		High-precision	Standard
Model	LK-011		LK-031/036	LK-081/086
Measurement mode	Normal	Mirror surface	–	–
Reference distance	11 mm 10 mm 9 mm 10 ±1mm	7.9 mm 7.0 mm 6.1 mm 7.0 ±0.9 mm	35 mm 30 mm 25 mm 30 ±5 mm	95 mm 80 mm 65 mm 80 ±15 mm
Repeatability	0.1 µm		1 µm	3 µm
Linearity	±0.25% of F.S.		±0.1% of F.S.	
Sampling cycle	128/256/512/2,048 µs		512 µs	1,024 µs

Type	Long-distance	
Model	LK-503	
Measurement mode	High-precision mode	Long-range mode
Reference distance	450 mm 350 mm 250 mm 350 ±100 mm	750 mm 500 mm 250 mm 500 ±250 mm
Repeatability	10 µm	50 µm
Linearity	±0.1% of F.S.	
Sampling cycle	1,024 µs	

Specifications

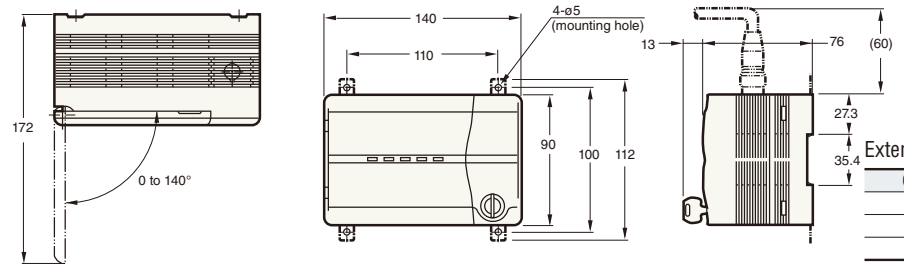
Type		Compact high-accuracy	High-precision	Standard	Long-distance *4	
Model	Sensor head	**LK-011**	**LK-031/036**	**LK-081/086**	**LK-503**	
	Controller	**LK-3101**	**LK-2001/2011**	**LK-2101/2111**	**LK-2503**	
Measurement mode		Normal (mirror surface)	—		High-precision mode	Long-range mode
Reference distance		10 mm (7.0 mm)	30 mm	80 mm	350 mm	500 mm
Measuring range		±1 mm (±0.9 mm)	±5 mm	±15 mm	±100 mm	±250 mm
Light source		Visible red semiconductor laser				
Output		0.95 mW				
Wavelength		670 nm			690 nm	
Laser Class	FDA (CDRH) Part 1040.10	Class II Laser Product				
	IEC 60825-1	Class 2 Laser Product				
Spot diameter (at reference distance)		Approx. 20 µm	Approx. 30 µm (LK-031) Approx. 30 x 850 µm (LK-036)	Approx. 70 µm (LK-081) Approx. 70 x 1100 µm (LK-086)	Approx. 0.7 mm	Approx. 0.3 mm
Repeatability		0.1 µm *1	1 µm *1	3 µm *1	10 µm *1	50 µm *1
Linearity		±0.25% of F.S. *2	±0.1% of F.S. *2			
Sampling cycle		128/256/512/2,048 µs selectable	512 µs	1024 µs		
Analogue output	Voltage output	±10 V (±9 V) (0.1 µm/mV) *3	±5 V (1 µm/mV) *3	±5 V (3 µm/mV) *3	±10 V (10 µm/mV) *3	±5 V (50 µm/mV) *3
	Impedance	100 Ω				
	Current output	4 to 20 mA (Applicable load: 350 Ωmax.)				
Alarm output		NPN: 100 mA max. (40 V max.) (N.C.), Residual voltage: 1 V max.				
Other functions		AUTO ZERO, Response selection, Shift/Span adjustment, Holding output in alarm condition				
Power supply		24 VDC ±10%, Ripple: 10% (P to P) or less				
Current consumption		400 mA max.				
Temperature fluctuation	Sensor head	0.04% of F.S./°C	0.01% of F.S./°C		0.02% of F.S./°C	
	Controller	0.005% of F.S./°C	0.01% of F.S./°C			
Enclosure rating		IP64	IP67			
Ambient light		Incandescent or fluorescent lamp: 10000 lux max.				
Ambient temperature		0 to 50°C				
Relative humidity		35 to 85%, No condensation				
Housing	Sensor head	Aluminium die-cast				
	Controller	Polycarbonate				
Weight (including cable)	Sensor head	Approx. 80 g	Approx. 260 g	Approx. 385 g	Approx. 700 g	
	Controller	Approx. 515 g				

*1 Repeatability was obtained using KEYENCE's analogue sensor controller (RD-50) with the number of averaging measurements set to 64.
Note: The ripple of the analogue output may be 1 mV or more due to common mode noise when observed with an oscilloscope or a high-speed A/D conversion board.
*2 Linearity was obtained using KEYENCE's standard target (Zirconia block gauge: LK-031/036, LK-081/086, LK-011, White ceramic block gauge: LK-503).
*3 When measurement is impossible, 12 V (31.2 mA) is output.
*4 The LK-503 can both be used in High-precision mode or Long-range mode.

Dimensions

Unit: mm

Controllers
LK-3101/2001/2011/2101/2111/2503

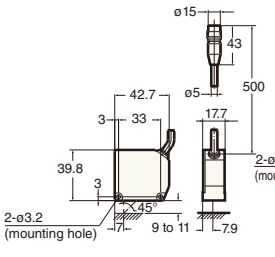


Extension cable (Optional)

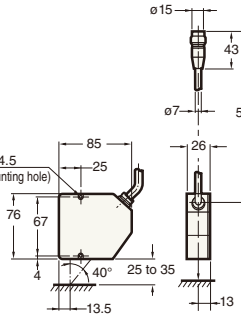
Cable length	Model
2 m	**LK-C2**
5 m	**LK-C5**
10 m	**LK-C10**

Sensor head

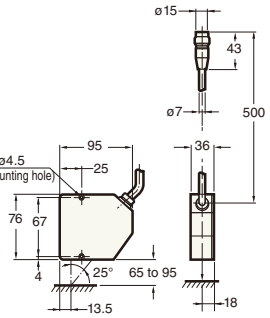
LK-011



LK-031/036

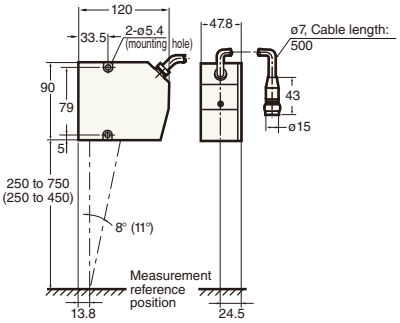


LK-081/086



LK-503

* Data in ( ) applies to at high-precision mode.



High-speed 2D/3D Laser Scanner

NEW

LJ-V7000 Series

CE

Features

- An emphasis on inline measurement
- The world's fastest at 64,000 profiles/sec.
- Blue laser optical system

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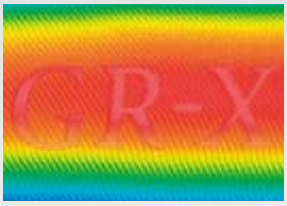
240 times greater than conventional devices

64,000 profiles/sec. sampling 12,800,000 points/sec. World's fastest



The LJ-V7000 Series has achieved the world's fastest sampling speed. Other devices within the 2D laser measuring device market cannot even come close.
It can measure the shapes of products running on a line or through equipment at ultra high speeds, with high-resolution and without missing an item. As an example, it can measure targets moving at 6.4 m/s with a pitch of 0.1 mm. The LJ-V7000 Series does not allow the passing of abnormal or defective areas.

64 times the dynamic range of conventional devices

Overwhelming workpiece response capabilities and detection stability Industry's greatest

Normally, detection stability is inversely proportional to speed. However, the LJ-V7000 Series has achieved the improvements in both speed and detection stability. Shapes are accurately measured even in cases where black surfaces or inclines with low reflectivity and metallic surfaces with high reflectivity are mixed together under the same optical axis.

Applications

Measuring loose bearing seals

Bearings are rotated to detect loose seals and perform a variety of measurements. High-speed measurement is possible, and in addition to bearings, the completion time to inspect shapes for rotating objects is also greatly improved.

Measuring welding grooves and bead shapes

Welding grooves and bead shapes are measured. Can be used on site without worry due to its strong IP67 structure, shock resistance, and high-flex cable.

Measuring the swelling of steel sheets

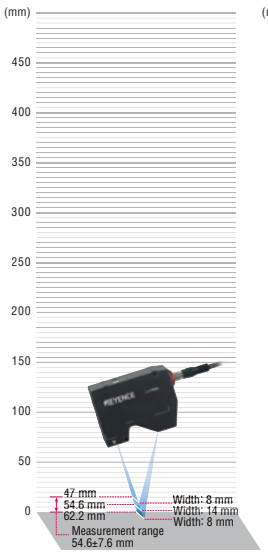
The shapes of continuous swelling on steel sheets that are flowing at high-speeds are measured. Because it is possible to measure at speeds of up to 64 kHz, you can perform high-definition measurement at fine pitches.

Measuring the shapes of projections and depressions on extrusion moulded products

Measurement is performed to determine if the shapes of moulded parts that are extruded at high speeds are correct or not. Various targets can be supported, including rubber, metal, ceramics, concrete, and food products.

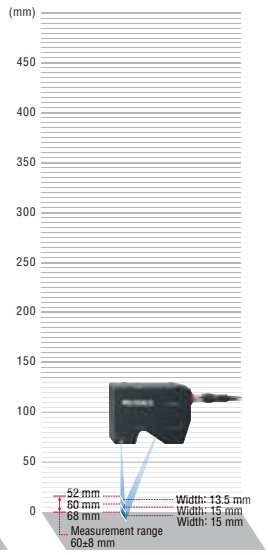
Lineup

High-accuracy specular reflection — LJ-V7060K



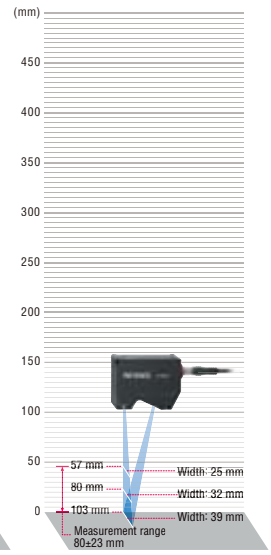
Measurement range	Z-axis	54.6±7.6 mm
	X-axis	14 mm
Repeatability	Z-axis	0.4 µm
	X-axis	5 µm

High-accuracy — LJ-V7060



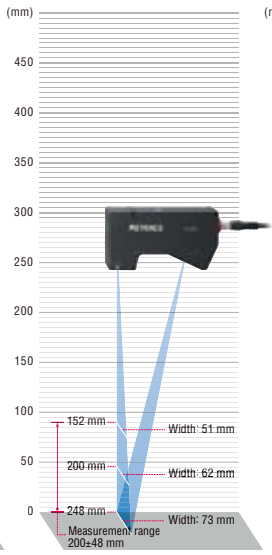
Measurement range	Z-axis	60±8 mm
	X-axis	15 mm
Repeatability	Z-axis	0.4 µm
	X-axis	5 µm

Middle range — LJ-V7080



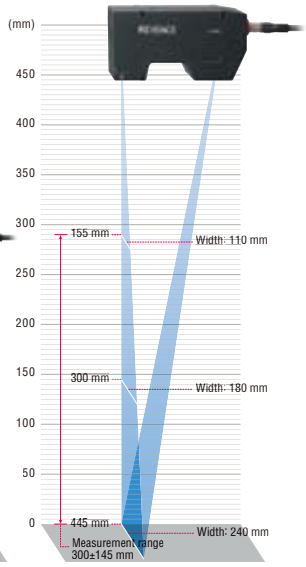
Measurement range	Z-axis	80±23 mm
	X-axis	32 mm
Repeatability	Z-axis	0.5 µm
	X-axis	10 µm

Long range — LJ-V7200



Measurement range	Z-axis	200±48 mm
	X-axis	62 mm
Repeatability	Z-axis	1 µm
	X-axis	20 µm

Ultra-long range — LJ-V7300



Measurement range	Z-axis	300±145 mm
	X-axis	180 mm
Repeatability	Z-axis	5 µm
	X-axis	60 µm

Controller

Controller
LJ-V7001(P)

Controller variation

NPN output type	**LJ-V7001**
PNP output type	**LJ-V7001P**

Display output unit
LJ-VM100

Settings monitor software
LJ-H2

USB cable (LJ-H2 accessory)
OP-66844

Console
OP-87504

EtherNet/IP unit
CB-EP100

Monitor

Touch panel monitor
CA-MP120T

Specialised monitor stand
OP-87262

Cable connector

Head connection cable
CB-B3(3 m)/CB-B10(10 m)

Head connection extension cable
CB-B5E(5 m)/CB-B10E(10 m)
CB-B20E(20 m)

Touch panel monitor extension cable
OP-87258(3 m)
OP-87259(10 m)

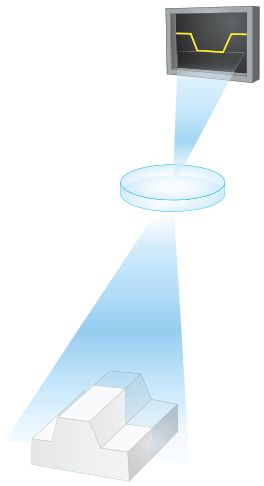
Display monitor connection cable
OP-66842(3 m)/OP-87055(10 m)

RS-232C cable
OP-96368(2.5 m)

D-sub9 pin connector
OP-26401

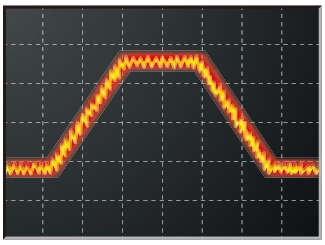
Blue laser optical system Forms images of profiles with ultra-stability and high-accuracy

World's first



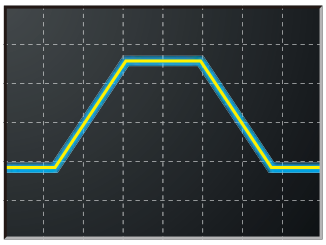
The LJ-V7000 Series is the first 2D laser displacement sensor in the world to adopt a blue laser. A sharp line beam is formed on the light-receiving element by focusing a short wavelength 405 nm laser to its maximum limit with a 2D Ernostar lens. This generates a stabilised high-precision profile. Also, the received light density for the laser has been increased to successfully secure a greater level of received light intensity. This achieves ultra-stable and highly accurate measurement with all types of targets that are typically difficult to detect.

Red laser (conventional)



With a conventional red laser, the beam that formed the image is thick, resulting in the generation of variation in the profile.

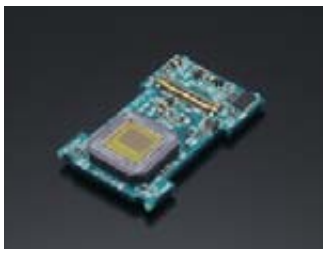
Blue laser (LJ-V)



With a blue laser, the image forming beam becomes sharp to enable the measurement of shapes with excellent accuracy.

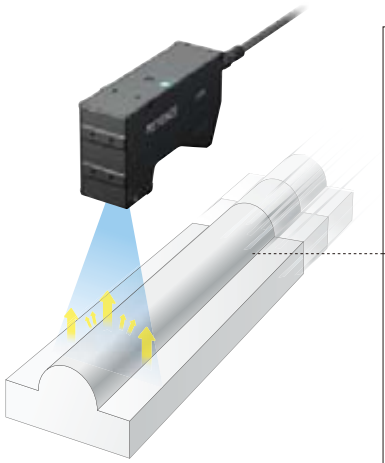
HSE^{3*}-CMOS Can perform stable measurement of any target even at ultra-high-speeds

Newly developed/world's greatest

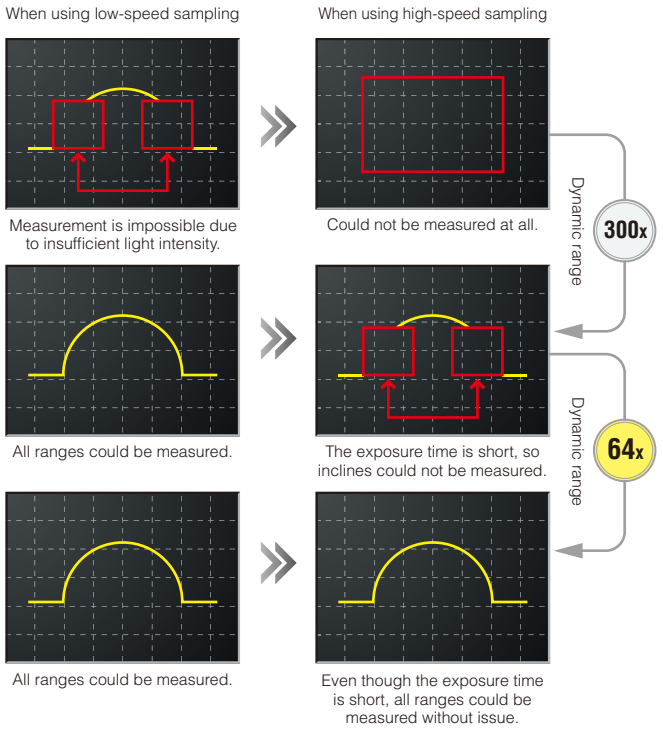


The LJ-V7000 Series is equipped with the newly developed HSE^3-CMOS. In addition to improved speed, the dynamic range has been further powered up over the established and conventional E^3-CMOS. Even with the extremely short exposure time of 64 kHz (15.6 µs) it has achieved sensitivity that allows it to reliably measure a range of surfaces from black (small amount of reflection) surfaces to those with lustre (large amount of reflection) as well a wide dynamic range.

* HS=High Speed E^3=Enhanced Eye Emulation

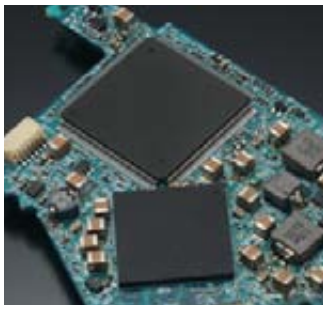


Reflectivity and light intensity in the width direction will change greatly depending on the shape, colour, material, or sampling speed (exposure time) of the target.


When using low-speed sampling
When using high-speed sampling
CMOS (General displacement metre)
E3-CMOS (LJ-G)
HSE3-CMOS (LJ-V)
Measurement is impossible due to insufficient light intensity.
Could not be measured at all.
All ranges could be measured.
The exposure time is short, so inclines could not be measured.
All ranges could be measured.
Even though the exposure time is short, all ranges could be measured without issue.
Dynamic range
300x
Dynamic range
64x

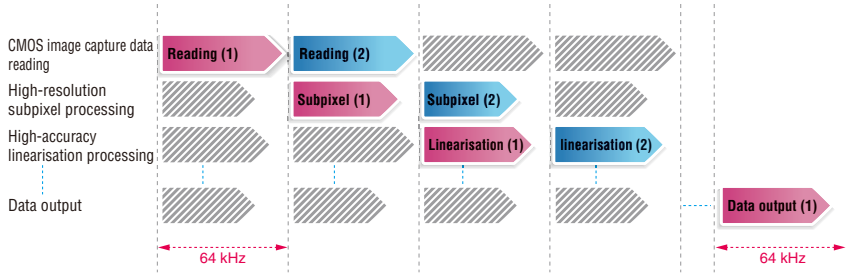
GP*64-Processor Achieves 64 kHz ultra-high-speed measurement

Newly developed



We have newly developed a custom IC that can perform ultra-high-speed pipeline processing that in addition to reading CMOS image capture data and performing high-resolution subpixel processing, also performs highprecision linearisation and data output. This allows for the measurement of objects moving at high-speeds with room to spare.

* G=Generating P=Profiles

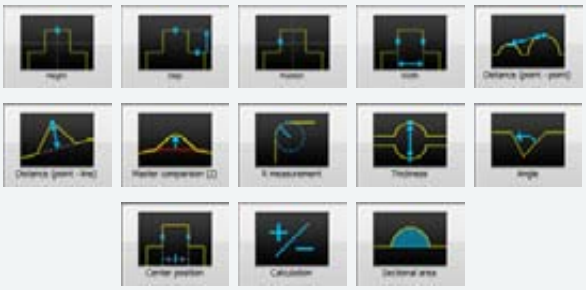


74 types of measurement modes
16-point complete simultaneous measurement

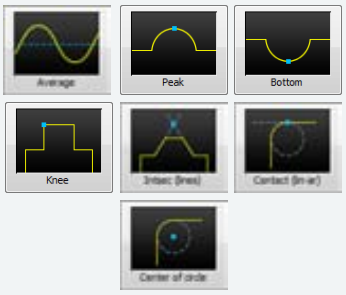
The industry's greatest variety

With 13 types of measurement details and 7 types of measurement target specifications, this single device can handle a total of 74 types of measurements. This single device achieves the measurement of a wide variety of target and responds to customer demands without missing a beat.

Types of measurements



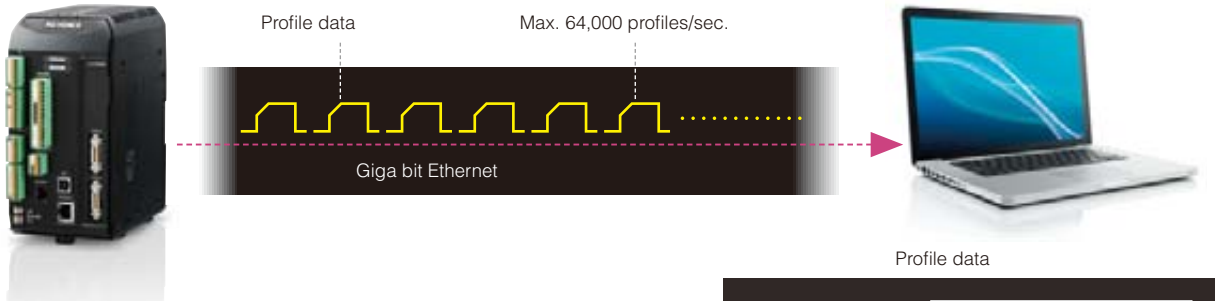
Types of measurement targets for each measurement



Any 16 points can be measured simultaneously with a measurement mode that has been selected from the 74 types that are available. Simultaneously completes measurements and inspections that were considered to be a lost cause until now.

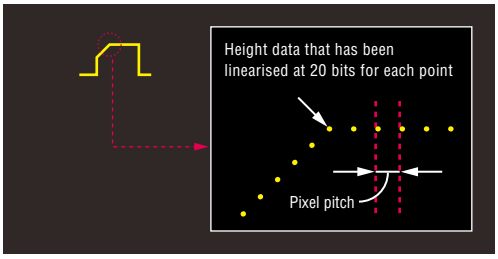
Continuous profile data output at a top speed of 64 kHz

Publicly open communications library



The LJ-V7000 Series has now been equipped with a TOE (TCP/IP off-load engine) specifically for processing high-speed communication. This achieves high throughput that does not affect CPU load. With this it is possible to output 64,000 units of profile data at a top speed of 1 second.
Rather than performing measurements in standard measurement mode, the LJ-V7000 Series is used as a measuring probe and is effective in cases when you would like to perform measurements using your own original algorithms. The communications library is also publicly available as standard.

Profile data



Specifications

Controller

Model		LJ-V7001	LJ-V7001P
No. of connectable sensors		Max. 2 units	
Display	Minimum display unit	0.1 µm, 0.00001 mm², 0.01°	
	Maximum display range	±99999.9 mm, ±999999 mm²	
Input terminal block	Laser remote interlock input	Non-voltage input	
	Encoder input	NPN open-collector output, voltage output (5 V/12 V/24 V), and line-driver output all supported	
	Trigger inputs	Non-voltage input	Voltage input
	Timing 1, 2 input		
	Auto-zero1, 2 input		
	Reset 1, 2 input		
	Start measurement/stop input		
	Start storage/stop input		
	Clear memory input		
	Laser OFF input		
	Programme switch input	Non-voltage input x 4 inputs	Voltage input x 4 inputs
Output terminal block	Analogue voltage output	±10 V x 2 outputs, Output impedance: 100 Ω	
	OUT comparator output	NPN open collector output x 12 outputs (Can freely assign 16 OUTs x 3 stage judgement results)	PNP open collector output x 12 outputs (Can freely assign 16 OUTs x 3 stage judgement results)
	Strobe output	NPN open collector output	PNP open collector output
	Disable trigger output		
	Memory FULL output		
	Ready output		
	Error output	NPN open collector output (N.C.)	PNP open collector output (N.C.)
Ethernet interface		1000BASE-T/100BASE-TX	
USB Interface		USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible)	
RS-232C interface		Measurement data output and control I/O (Can select a baud rate of up to 115,200 bits/s)	
Rating	Voltage	Includes 24 VDC ±10% ripple (P-P)	
	Maximum current consumption	1.3 A or less when connected to 1 head/ 1.9 A or less when connected to 2 heads	
Environmental resistance	Operating ambient temperature	0 to +50°C	
	Operating ambient humidity	20 to 85% RH (No condensation)	
Weight		Approx. 1500 g	

- The rating for NPN open-collector output is up to 50 mA (40 V or less), residual voltage of up to 1 V
- The rating for PNP open-collector output is up to 50 mA (30 V or less), residual voltage of up to 1 V
- The rating for non-voltage input is up to 1 V for ON voltage and up to 0.6 mA for OFF current
- The rating for voltage input is a maximum input voltage of 26.4 V, a minimum ON voltage of 10.8 V, and up to 0.6 mA for OFF current

Display output unit

Model		LJ-VM100
Monitor output		Analogue RGB XGA (1024 x 768) Touch panel monitor (CA-MP120T), specialised connector included
Voltage		Supplied from the controller
Power consumption		2.5 W or less
Environmental resistance	Operating ambient temperature	0 to +50°C
	Operating ambient humidity	20 to 85% RH (No condensation)
Weight		Approx. 400 g

LJ-H2 (LJ-Navigator 2) operation system environment

Item		Minimum system requirements
PC Interface	Ethernet*1	1000BASE-T/100BASE-TX
	USB*1	USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible)
Supported OS		Windows7 (Home Premium, Professional, Ultimate) Windows Vista (Home Basic, Home Premium, Business, Ultimate) Windows XP (SP2 or later) (Home Edition, Professional Edition)
Supported languages*2		Japanese, English, German, French, Simplified Chinese, Traditional Chinese
CPU		Core i3 2.3 GHz or higher
Memory capacity		2 GB or more
2D cache memory		2 MB or more
Free space on hard disk		10 GB or more
Display resolution		XGA (1024 x 768) or higher
Weight		Approx. 400 g

*1 Connections through a hub are not covered under warranty.
*2 All languages except for Japanese and English are expected to receive support in the near future.
- Windows is a registered trademark of the Microsoft Corporation, U.S.A.
- Core is a registered trademark of the Intel Corporation.

Communication unit

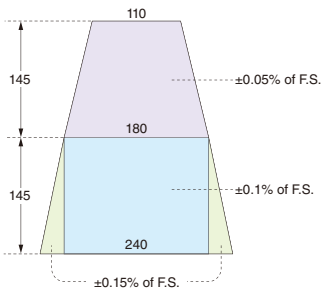
Model		CB-EP100
Compatible network		EtherNet/IP and displacement sensor's own protocols (socket communication)
Eternet	Compliant standards	IEEE 802.3 (10BASE-T), IEEE 802.3u (100BASE-TX)
	Transmission speed	10 Mbps (10BASE-T), 100 Mbps (100BASE-TX)
	Transmission media	STP or Category 3 or higher UTP (10BASE-T), STP or Category 5 or higher UTP (100BASE-TX)
	Maximum cable length	100 m (Distance between the unit and Ethernet switch)
	Maximum number of connectable hubs*1	4 hubs (10BASE-T), 2 hubs (100BASE-TX)
EtherNet/IP	Supported functions	Cyclic communication (Implicit messaging)
		Message communication (Explicit messaging), Compatible with UCMM and Class 3
	Number of connections	64
	RPI	0.5 ms to 10000 ms (in 0.5 ms)
	Tolerable communication bandwidth for cyclic communication	6000 pps
	Message communication	UCMM, Class 3
	Conformance test	Compatible with Version A9
Power supply voltage		24 VDC, including ±10% ripple (P-P) (supplied from the controller unit of the laser scanner)
Power consumption		2400 mW max.
Environmental resistance	Operating ambient temperature	0 to +50°C
	Operating ambient humidity	20 to 85% RH (No condensation)
Weight		Approx. 470 g

*1 The number of connectable hubs is not limited when using a switching hub.

Sensor head unit

Model		LJ-V7060K	LJ-V7060	LJ-V7080	LJ-V7200	LJ-V7300
Mounting conditions		Specular reflection	Diffuse reflection			
Reference distance		54.6 mm	60 mm	80 mm	200 mm	300 mm
Measurement range	Z-axis (height)	±7.6 mm (F.S.=15.2 mm)	±8 mm (F.S.=16 mm)	±23 mm (F.S.=46 mm)	±48 mm (F.S.=96 mm)	±145 mm (F.S.=290 mm)
	X-axis (width) NEAR side	8 mm	13.5 mm	25 mm	51 mm	110 mm
	X-axis (width) Reference distance	14 mm	15 mm	32 mm	62 mm	180 mm
	X-axis (width) Far side	8 mm	15 mm	39 mm	73 mm	240 mm
Light source		Blue semiconductor laser				
	Wavelength	405 nm (visible beam)				
	Laser class IEC60825-1 FDA(CDRH) Part 1040.10*11	Class 2 Laser Product	Class 2M Laser Product*10	Class 2 Laser Product		
	Output	4.8 mW	10 mW	4.8 mW		
Spot shape (reference distance)		Approx. 21 mm x 45 µm		Approx. 48 mm x 48 µm	Approx. 90 mm x 85 µm	Approx. 240 mm x 610 µm
Repeatability*1	Z-axis (height) *2	0.4 µm		0.5 µm	1 µm	5 µm
	X-axis (width) *3	5 µm		10 µm	20 µm	60 µm
Linearity	Z-axis (height) *4	±0.1% of F.S.				±0.05 to *5 ±0.15% of F.S.
Profile Data interval	X-axis (width)	20 µm		50 µm	100 µm	300 µm
Sampling cycle (trigger interval)*6		Top speed: 16 µs (high-speed mode) Top speed: 32 µs (advanced function mode)				
Temperature characteristics		0.01% of F.S./°C				
Environmental resistance	Enclosure rating*7	IP67 (IEC60529)				
	Ambient operating illuminance*8	Incandescent lamp: 10000 lux max				
	Ambient temperature*9	0 to +45°C				
	Operating Ambient humidity	20 to 85% RH (No condensation)				
	Vibration resistance	10 to 57 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 3 hours respectively				
	Impact resistance	15 G/6 msec				
Material		Aluminium				
Weight		Approx. 450 g		Approx. 400 g	Approx. 550 g	Approx. 1000 g

*1 This value is from a case in which measurement has been performed with a reference distance at an average frequency of 4096 times.
*2 The measurement targets are KEYENCE standard targets (white diffused objects). This value is from a case in which the average height of the default setting area has been measured in height mode. All other settings are default.
*3 The measurement target is a pin gauge. This value is from a case in which the position of the intersection between the rounded surface of the pin gauge and the edge level has been measured in position mode. All other settings are default.
*4 The measurement targets are KEYENCE standard targets (white diffused objects). The profile data is from a case in which measurement has been performed with 64x smoothing and 8x averaging. All other settings are default.
*5 The linearity will differ depending on the measurement area. (See the diagram on the right.)
*6 When the measurement area is at its minimum, binning is ON, image capture mode is set to standard, and parallel image capture is ON in high-speed mode. All other settings are default.
When the measurement area is at its minimum, binning is ON and image capture mode is set to standard in advanced function mode. All other settings are default.
7 This value is from a case in which the head cable (CB-B) or extension cable (CB-B*E) has been connected.
*8 When measuring white paper, this is the illuminance for the light-receiving surface of the sensor head when light has been shined onto white paper.
*9 Use the sensor head after first mounting it on a metal plate.
*10 Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.
*11 The laser classification for FDA(CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.



Cables

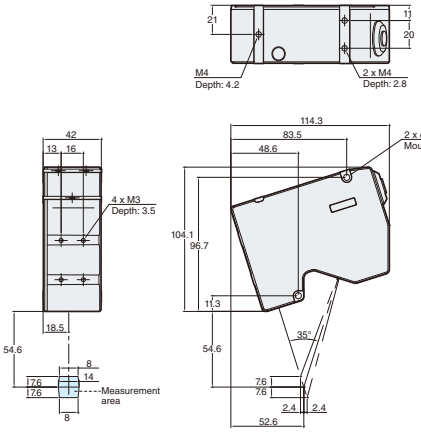
Model	CB-B3	CB-B10	CB-B5E	CB-B10E	CB-B20E
Cable type	Head cable		Extension cable		
Cable length	3 m	10 m	5 m	10 m	20 m
Minimum bend radius	22 mm				
Enclosure rating*1	IP67 (IEC60529)				
Material (outer covering)	PVC				
Weight	Approx. 250 g	Approx. 750 g	Approx. 400 g	Approx. 800 g	Approx. 1500 g

*1 This value is from a case in which the sensor head has been connected. However, the controller side connector is not included.
• Regarding cable extension between the head and controller: Up to 2 cables can be connected with the CB-BxxE, and these cables should be kept to a total length of 30 m or less.

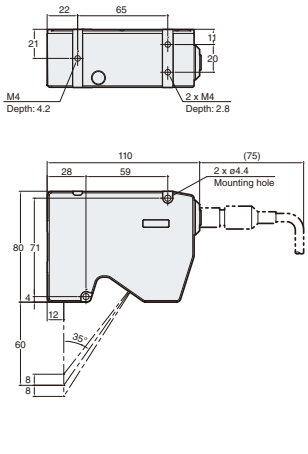
Dimensions

Sensor head

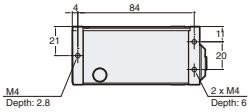
High-accuracy specular reflection model
LJ-V7060K

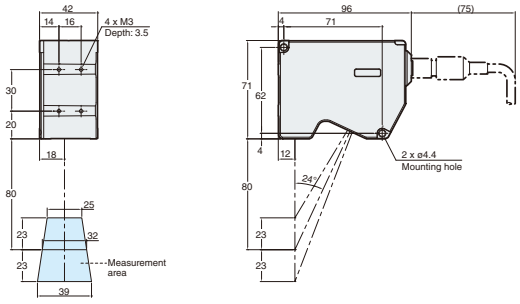


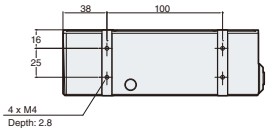
High-accuracy model
LJ-V7060



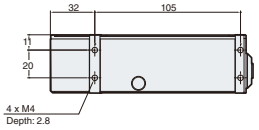
Middle-range model
LJ-V7080

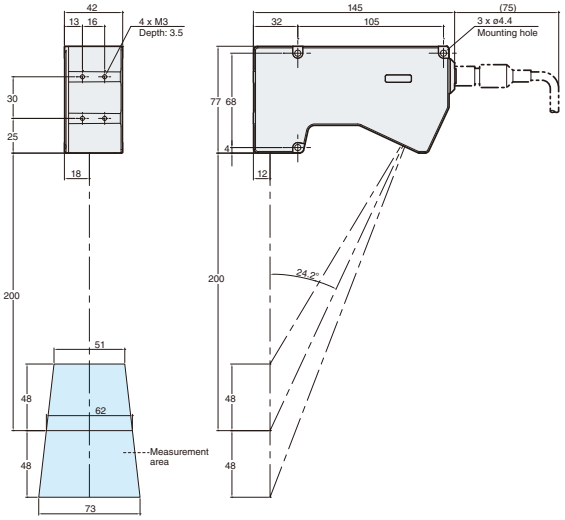




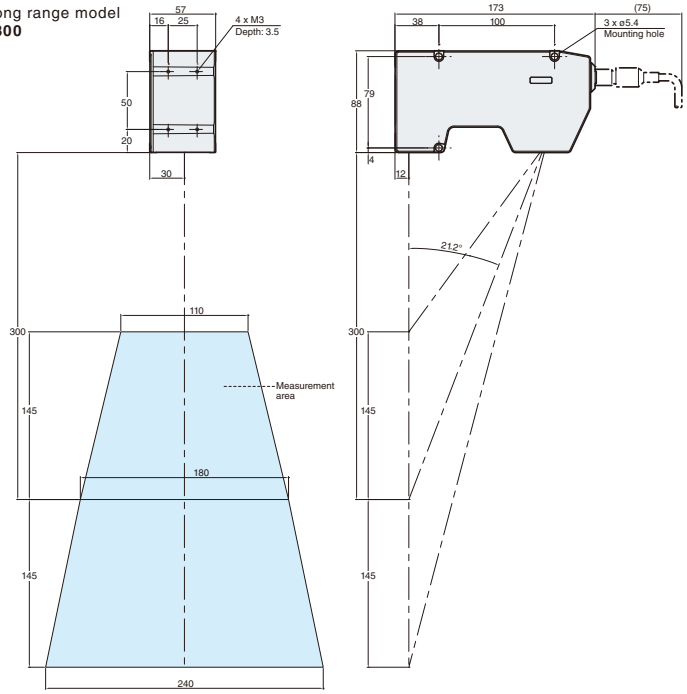


Long range model
LJ-V7200



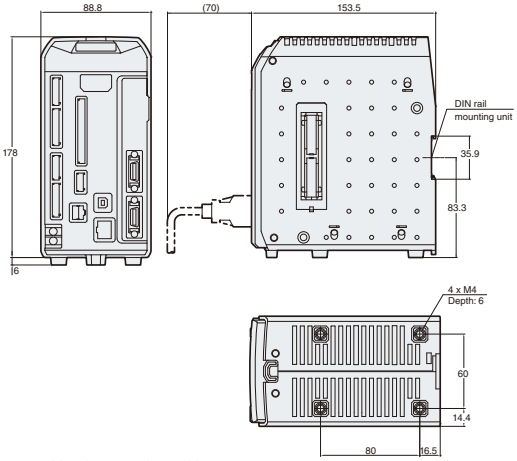


Ultra-long range model
LJ-V7300

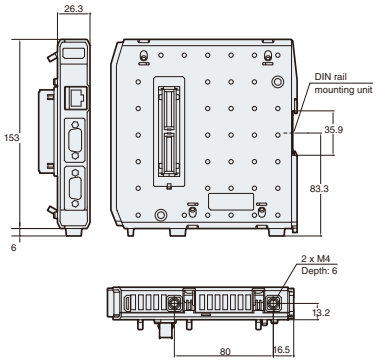


Controller

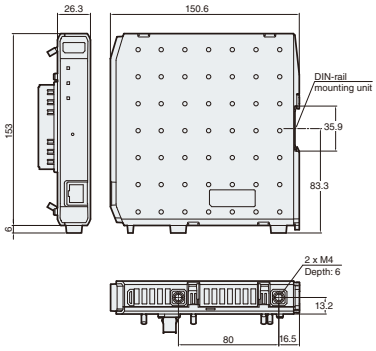
Multi-function controller
LJ-V7001(P)



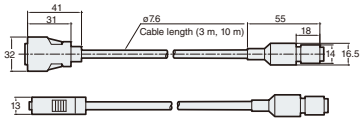
Display output unit
LJ-VM100



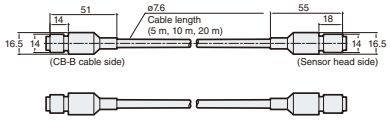
EtherNet/IP unit
CB-EP100



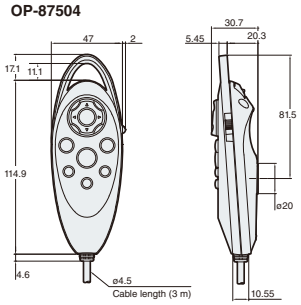
Head connection cable
CB-B3/CB-B10



Head connection extension cable
CB-B5E/CB-B10E/CB-B20E

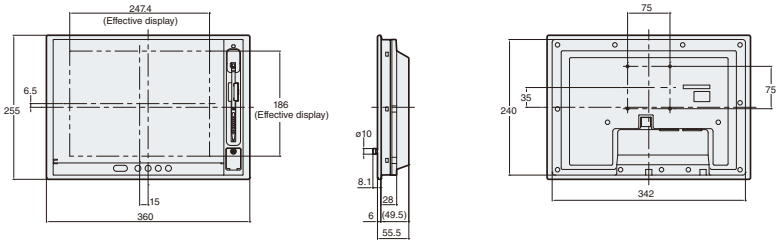


Console
OP-87504

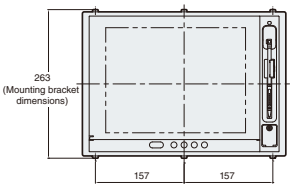


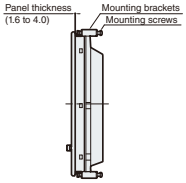
Monitor

Touch panel monitor
CA-MP120T

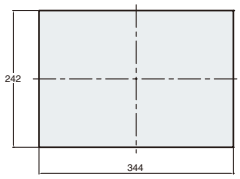


Panel mounting

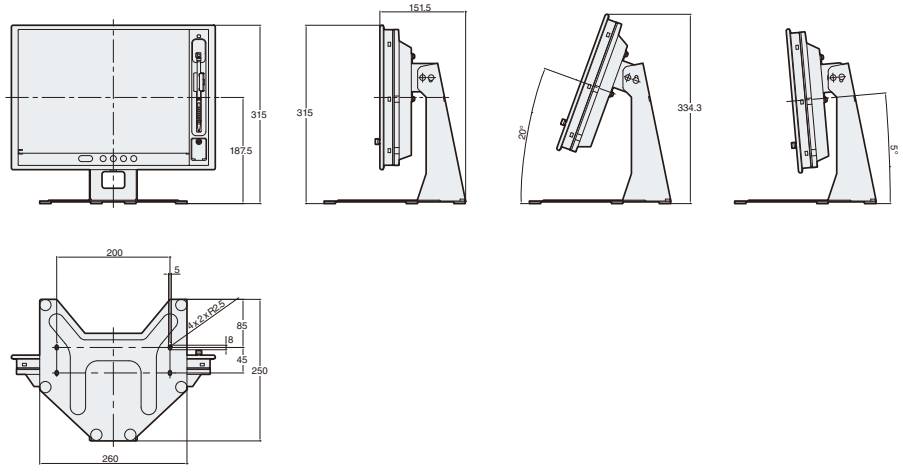




Panel cut dimensions



Specialised monitor stand
OP-87262



High-Accuracy 2D Laser Displacement Sensor

LJ-G Series

CE

Features

- Linearity of ±0.1% of F.S.
- High-speed sampling of 3.8 ms
- Simultaneous measurement/judgement of up to 8 features
- Stable measurement for all targets

Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

www.measurecentral.com

8-point simultaneous measurement/judgment

Best in its class

The LJ-G Series provides 8-point simultaneous measurement in various measuring modes (height, width, height difference, angle, profile, cross-section area, etc.). Desired measuring points can be specified relative to a profile waveform. Furthermore, the LJ-G Series provides outputs of individual measured values and upper/lower tolerance comparator outputs.

Measurements

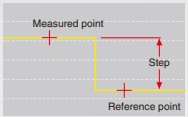
Peak height	Bottom height	Average height	Gap
Width/Position	Section area	Angle/Intersection	Profile comparison

Measurement menus

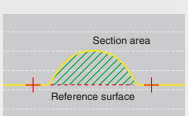
HEIGHT
Measures height in a specified range.

WIDTH/ POSITION
Measures width/ position with a specified condition.

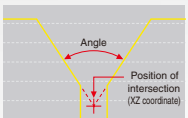
STEP
Determines the height difference between a measured point and the reference point.



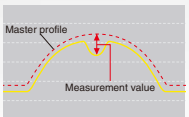
SECTION AREA
Measures the area on the basis of the reference surface.



ANGLE/ INTERSECTION
Measures the angle or intersection of detected lines.



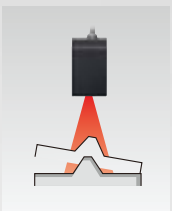
PROFILE COMPARISON
Compares the target profile with the master profile to measure the largest difference.



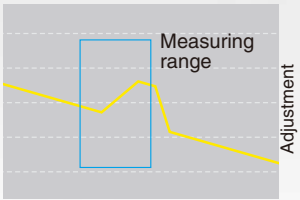
Useful Adjustment Functions

POSITION ADJUSTMENT FUNCTION

After the adjustment, the LJ-G Series can provide stable measurements though the targets are not neatly arranged or positioned.

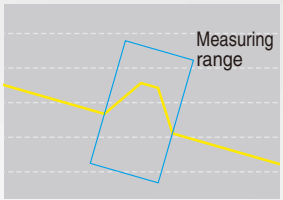


Displacement of target



Since the workpiece is not in the measuring range, a precise measurement cannot be carried out.

Adjustment



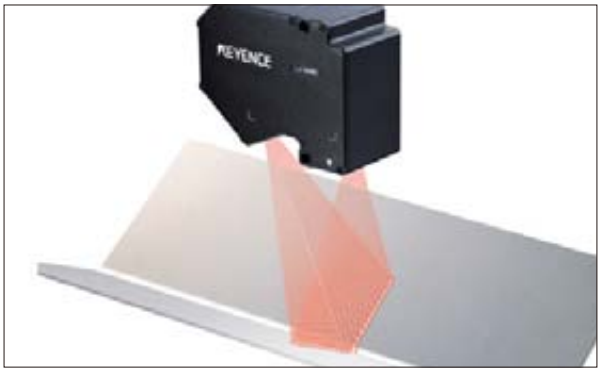
The measuring range moves according to the displacement of the workpiece for precise measurement.

Applications

Confirmation of PCB mounting height

Confirmation of door/hood mounting accuracy

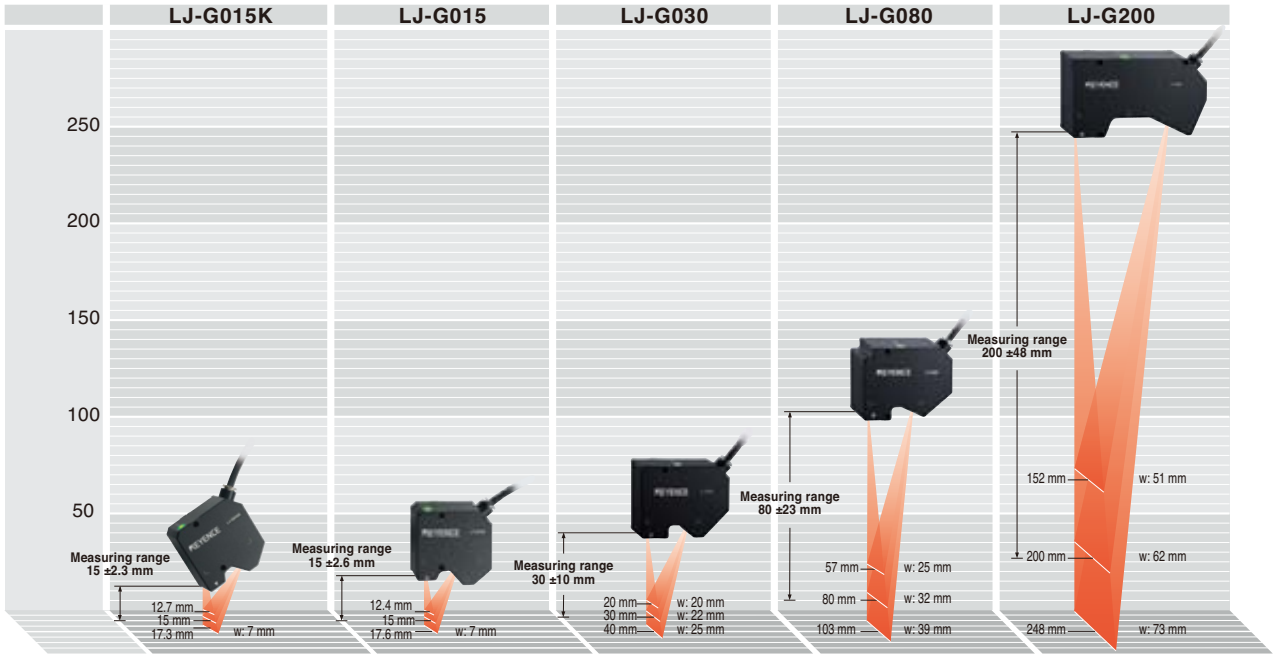
Confirmation of sealant coating profile



Pre-weld position feedback

Lineup

Sensor head

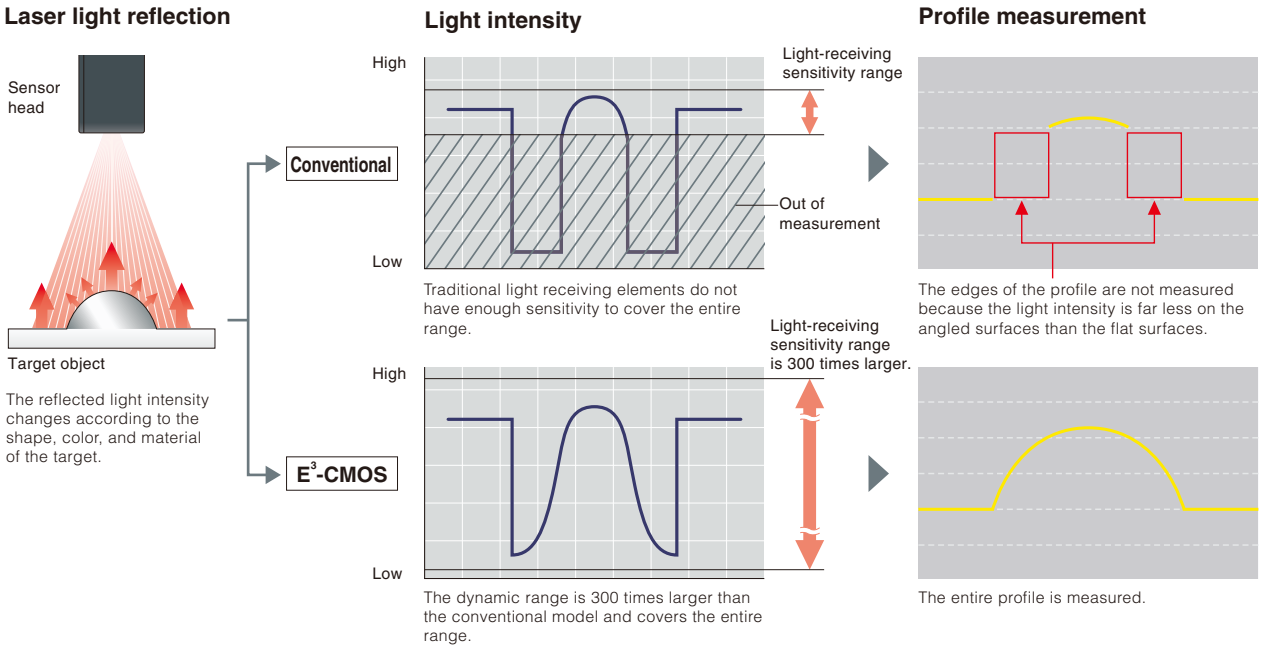


Z-axis (Height)	15 ±2.3 mm	15 ±2.6 mm	30 ±10 mm	80 ±23 mm	200 ±48 mm
X-axis (Width)	7 mm	7 mm	22 mm	32 mm	62 mm
Z-axis repeatability	0.2 µm	0.2 µm	1 µm	1 µm	2 µm
X-axis repeatability	2.5 µm	2.5 µm	5 µm	10 µm	20 µm

E³-CMOS providing ultra-wide dynamic range First in the world

The E³-CMOS provides ultra-wide dynamic range which is approximately 300 times wider than conventional modes. The LJ-G Series enables target profile measurement and the measurement of different target materials, such as black rubber (low reflected light intensity) and reflective metal (high reflected light intensity).

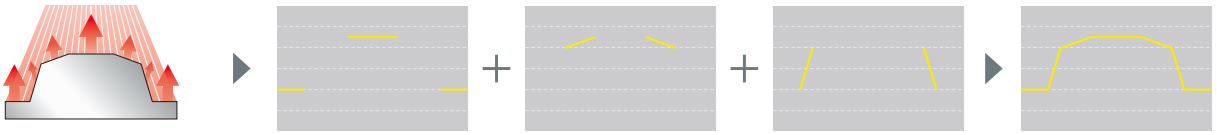
* E³-CMOS sensor: Enhanced Eye Emulation CMOS image sensor


Laser light reflection
Light intensity
Profile measurement
Sensor head
Conventional
E³-CMOS
Target object
The reflected light intensity changes according to the shape, color, and material of the target.
High
Low
Light-receiving sensitivity range
Out of measurement
Traditional light receiving elements do not have enough sensitivity to cover the entire range.
The edges of the profile are not measured because the light intensity is far less on the angled surfaces than the flat surfaces.
Light-receiving sensitivity range is 300 times larger.
The dynamic range is 300 times larger than the conventional model and covers the entire range.
The entire profile is measured.

ASAP (Automatic Sensitivity Adjustment by Pixel) NEW

This function adjusts the sensitivity and laser power of the E³-CMOS to obtain suitable waveform data for each measurement position that has a different reflectance. The obtained data is merged as a single measurement profile.

Dynamic range 6000x



High capacity memory for saving data Best in its class

High capacity memory is built into the controller. A memory card slot is included to store the production records of mass-produced products.

Handling many product types

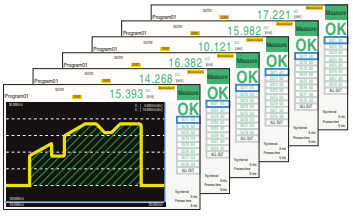
The built-in memory can store up to 16 programs. When the memory card is used, up to 160 programs can be stored to handle various product types.

	Program setting	Profile saving	Data storage
Internal memory	16	1024 x 2	65536 x 8
CF(1GB)	160	1024 x 300	65536 x 3200

Handles 160 types

Profile saving

For analyzing NG records or production history.



1024 profiles

Specifications

Model			LJ-G015K	LJ-G015	LJ-G030	LJ-G080	LJ-G200
Type			Specular reflective	Diffuse reflective			
Reference distance			15 mm		30 mm	80 mm	200 mm
Measuring range	Z-axis (Height)		±2.3 mm	±2.6 mm	±10 mm	±23 mm	±48 mm
	X-axis (Width)	Near	6.5 mm		20 mm	25 mm	51 mm
		Reference distance	7.0 mm		22 mm	32 mm	62 mm
		Far	7.5 mm		25 mm	39 mm	73 mm
Light source			Red semiconductor laser				
		Wavelength	655 nm (Visible light)				
		Laser Class	Class II Laser Product (FDA (CDRH) PART1040.10), Class 2 Laser Product (IEC 60825-1)				
		Output	0.95 mW				
Spot diameter (at reference distance)			Approx. 32 µm x 12 mm		Approx. 40 µm x 25 mm	Approx. 80 µm x 46 mm	Approx. 180 µm x 70 mm
Repeatability*1		Z-axis (Height) *2	0.2 µm		1 µm	1 µm	2 µm
		X-axis (Width) *3	2.5 µm		5 µm	10 µm	20 µm
Linearity Z-axis (Height) *2			±0.1% of F.S.				
Sampling frequency (Trigger interval) *4			3.8 ms				
Temperature characteristics			0.02% of F.S./°C				
Environmental resistance		Enclosure rating	IP67 (IEC60529)				
		Ambient light *5	Incandescent lamp or fluorescent lamp: 5000 lux max.				
		Ambient temperature	0 to 50°C				
		Relative humidity	35 to 85%, No condensation				
		Vibration	10 to 55 Hz, double amplitude 1.5 mm, two hours in each direction of X, Y, and Z				
Material			Aluminium				
Weight			Approx. 260 g		Approx. 290 g	Approx. 350 g	Approx. 480 g

*1 The value obtained after 64 times averaging at the reference distance.
*2 The target is KEYENCE standard object. (White diffusing material). The value is the average of the widths in the Height mode.
*3 The target is ø10 mm pin gauge. The value is the edge in the Position mode after 16 times of the Smoothing.
*4 With initial setting, minimum measuring range, and single smoothing processing
*5 The illumination on the receiver of the sensor head when targeting an illuminated white paper.

Controller

Model		LJ-G5001	LJ-G5001P
Sensor head compatibility		Compatible	
Number of connectable sensors		2 units max.	
Display	Minimum display unit	0.1 µm *1, 0.001 mm², 0.01°	
	Maximum display range	±99999.9 mm, ±999999 mm², ±99999.9°	
Input terminal block	Laser remote interlock input	Non-voltage input	
	Trigger input	For sensor head A, non-voltage input	For sensor head A, voltage input
	Timing 1 input	Non-voltage input	Voltage input
	Auto-zero 1 input		
	Reset input		
Output terminal block	Analogue voltage output	±10 V x 2 outputs, output impedance: 100 Ω	
	Total judgment output	NPN open-collector output	PNP open-collector output
	Error output	NPN open-collector output (N.C.)	PNP open-collector output (N.C.)
	Process output	NPN open-collector output	PNP open-collector output
	Trigger input enable output	For sensor head A, NPN open-collector output	For sensor head A, PNP open-collector output
	Adjusted error output		
Expansion connector	Timing 2 input	Non-voltage input	Voltage input
	Auto-zero 2 input		
	Trigger input	For sensor head B, non-voltage input	For sensor head B, voltage input
	Program switching input	Non-voltage input, 4 inputs	Voltage input, 4 inputs
	Memory card save input	Non-voltage input	Voltage input
	Laser-Off input	For sensor head A/B, non-voltage input	For sensor head A/B, voltage input
	Judgment/Binary output *2	3-level judgment output: OUT1 to OUT8, total judgment output Binary output: OUT1 to OUT8 measured data output (21 bits) NPN open-collector output	3-level judgment output: OUT1 to OUT8, total judgment output Binary output: OUT1 to OUT8 measured data output (21 bits) PNP open-collector output
	Strobe output	NPN open-collector output	PNP open-collector output
	Trigger input enable output	For sensor head B, NPN open-collector output	For sensor head B, PNP open-collector output
	Adjusted error output		
Analogue RGB monitor output		SVGA (800 x 600 pixels)	
RS-232C interface		Measured data output and control input/output (Maximum baud rate: 115200 bps, selectable)	
USB interface		In conformity with USB Revision 2.0 HI-SPEED (USB 1.1 Full-SPEED compatible)	
Ethernet interface		100BASE-TX/10BASE-T	
Memory card		Compatible with NR-M32 (32 MB), GR-M256 (256MB), and NR-M1G (1GB). (with FAT32)	
Major functions		Sensor heads calculation, Profile adjustment, Filter, Smoothing, Averaging, Position adjustment, OUT name change, Measurement mode selection (Height, position, gap, width, centre position, section area, intersection, angle, profile comparison, profile tracking), Scaling, Average, Measurement, Measured value alarm, Tolerance setting, Auto-zero, Storage (data/profile), Memory card saving, Program memory, Trigger mode change, Mutual interference prevention, Measuring range change, Calibration, Laser light adjustment, Sampling time setting, Mask, Profile alarm setting, Inclination adjustment, Height adjustment, Display language switch, Setting support software connection, Trigger pitch/Measuring time display, etc.	
Ratings	Power supply voltage	24 VDC ±10%, Ripple: 10% (P to P) or less	
	Current consumption	800 mA or less with 1 sensor head/1 A or less with two sensor heads	
Environmental resistance	Ambient temperature	0 to 50°C	
	Relative humidity	35 to 85%, No condensation	
Weight		Approx. 1050 g	

*1 When LJ-G015 or LJ-G015K is connected only. When other sensor heads are connected, the minimum display unit is 1 µm.
*2 Time-sharing output of judgment results or binary measured data.
The rating of the NPN open-collector output: 50 mA max. (30 V max.), residual voltage of 1 V max. The rating of the PNP open-collector output: 50 mA max. (30 V max.), residual voltage of 1 V max.
The rating of the non-voltage input: 1 V or less ON voltage, 0.6 mA or less OFF current (Trigger input terminal: 1 V or less ON voltage, 1.0 mA or less OFF current)
The rating of the voltage input: 26.4 V maximum rating, 10.8 V or less ON voltage, 0.6 mA or less OFF current (Trigger input terminal: 26.4 V maximum rating, 10.8 V or less ON voltage, 1.0 mA or less OFF current)

Hardware environment for the LJ-H1W (LJ-Navigator)

Model	LJ-H1W
CPU	Pentium III, 400 MHz or higher
Supported OS	Windows 7*1/Windows Vista*2/Windows XP Professional Edition/ Home Edition/Windows 2000 Professional
Memory capacity	128 MB or more
Display	XGA (1024 x 768 pixels) or greater, 256 colours or greater
Hard disk space	30 MB or more
Interface*3	Includes one of the following: USB 2.0/1.1*4, Ethernet*5, RS-232C (Serial port)

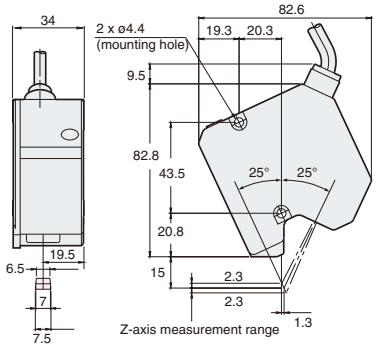
• Windows is a registered trademark of Microsoft Corporation of America.
• Pentium is a registered trademark of Intel Corporation.
*1 Home Premium, Professional and Ultimate editions are supported.
*2 Ultimate, Business, Home Premium, Home Basic editions are supported. For Windows Vista, Ver. 1.6 and later versions are supported.
*3 Select one for communication. Multiple interfaces cannot be used for communication at the same time.
*4 Operations are not guaranteed when connected through a USB hub.
*5 Operations are not guaranteed when connected through a router or a LAN connection.

Dimensions

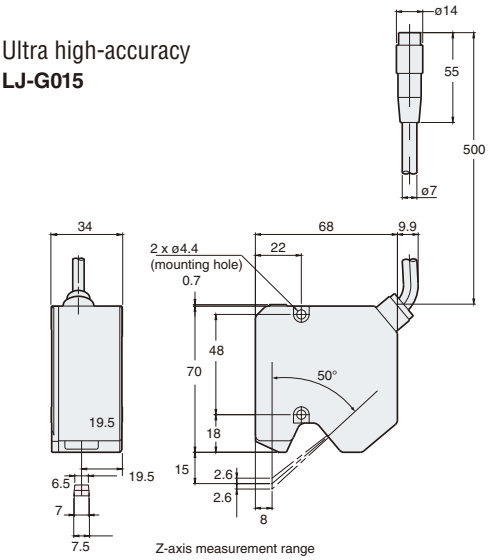
Unit: mm

Sensor head

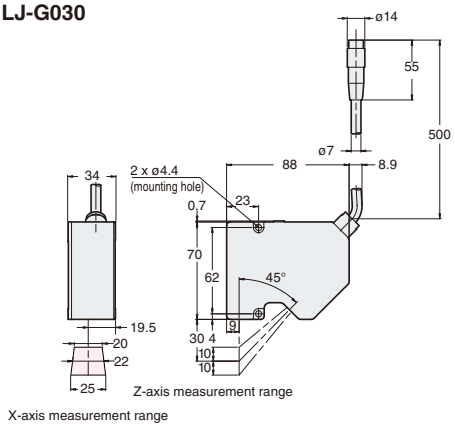
Ultra high-accuracy specular reflection
LJ-G015K



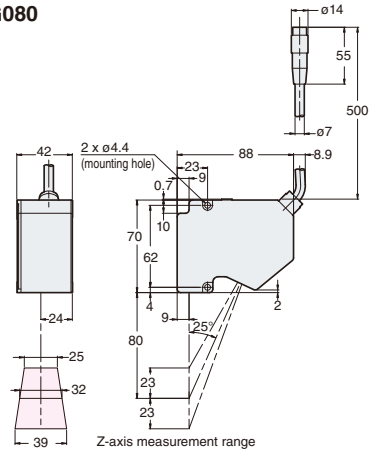
Ultra high-accuracy
LJ-G015



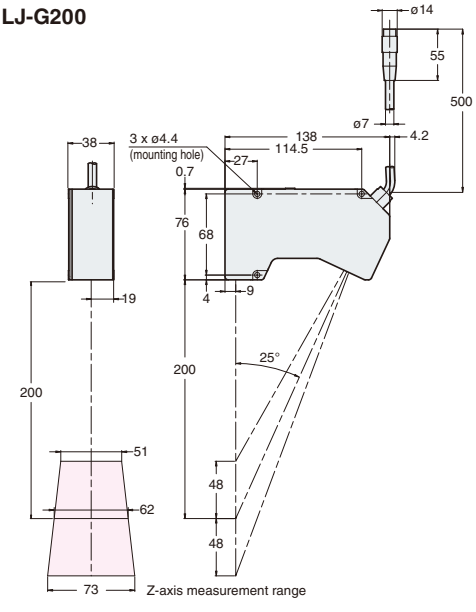
LJ-G030



LJ-G080

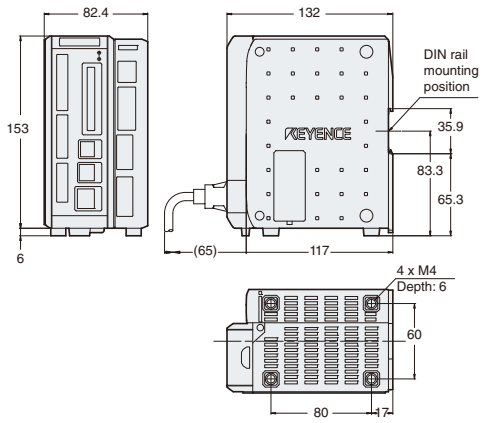


LJ-G200

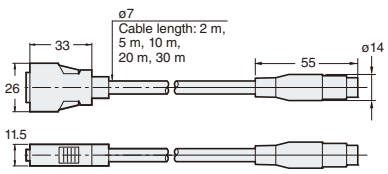


Controller

LJ-G5001(P)



Cable between the sensor head and the controller
LJ-GC2/5/10/20/30



Cable between the sensor head and the controller

Model	LJ-GC2	LJ-GC5	LJ-GC10	LJ-GC20	LJ-GC30
Cable length	2 m	5 m	10 m	20 m	30 m
Weight	Approx. 200 g	Approx. 400 g	Approx. 750 g	Approx. 1400 g	Approx. 2000 g

Micro-Head Spectral-Interference Laser Displacement Meter

SI-F1000 Series

CE

Features

- Resolution of 0.001 µm
- Micro-head size of ø2 mm
- Spectral interference method

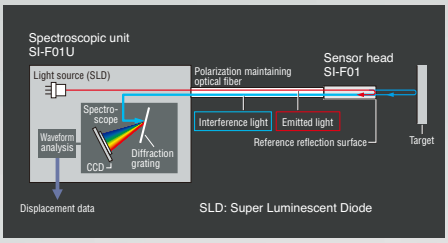
Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

www.measurecentral.com

Spectral interface method First in the Industry

Development of a new principle can meet incompatible needs for small size with high accuracy that was previously impossible.



SLD

Part of the broad wavelength light emitted from the SLD is reflected by the head's reference surface, while the part that passes the reference surface is mirror-reflected on the target and returns into the head.

Interference light

The two reflected light beams interfere with each other. The intensity of the interference light with a specific wavelength is determined according to the distance between the reference surface and the target. The relative maximum interference is reached when the determined distance is an integral multiple of the wavelength.

Spectroscopic analysis

Splitting the interference light into different wavelengths with the spectroscope produces an optical intensity distribution for a specific wavelength. The distance to the target is obtained by carrying out waveform analysis on the distribution.

No heat generation and no noise

Advantages of the optical fiber head structure

The measurement head consists of only optical fibers and lenses, with no electronic parts.

Small size, light weight, and heat resistant

These features greatly reduce the constraints on selecting an installation area. A micro-head of this type can be used with a wider range of measurement applications because it can be installed in places where conventional units cannot.

No heat generation

An exothermic body is one of the error-causing factors in high-accuracy measurement. The optical fiber head structure produces no heat generation in the head section.

Not influenced by electromagnetic noise

The measurement head contains no electrical circuits. Because of this, it is not influenced by electromagnetic noise, which is difficult to isolate and remove.

Resolution of 1 nm (0.001 µm) Highest in its class

High resolution of 1 nm (0.001 µm) has been realised by the development of new principles and the application of sophisticated controllers. This resolution can fully respond to a variety of needs for high accuracy.

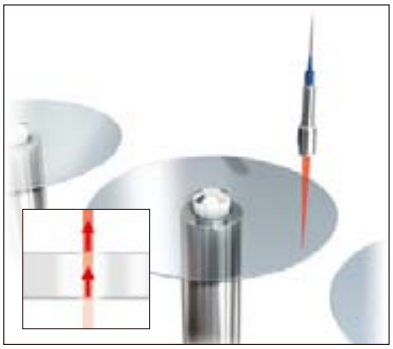
Head size of ø2 mm World's smallest

The simple fiberoptic structure for the measurement head has allowed KEYENCE to develop the world's smallest sensor head without any heat generation problems associated with compact electronics. In addition as the sensor head has no electronic components, it is immune to electromagnetic noise.

Applications

Measuring the behavior of critical components inside an assembled device

Positioning of high precision stages



Measuring the thickness of glass discs

Lineup

Type	Model		Major technical data	
Micro-Head Type Best suited for measurements requiring ultra high-accuracy, compact spaces, or high temperatures.	**SI-F01**		Measurement range Resolution Linearity Head size	0.05 to 1.1 mm 0.001 µm ±0.2 µm ø2 mm
Long Distance Type Long-distance measurement with high accuracy.	**SI-F10**		Measurement range Resolution Linearity Head size	11.3 to 12.35 mm 0.01 µm ±0.3 µm ø8 mm
Thickness (Gap) Measurement Type High accuracy achieved by targeting thickness measurement.	**SI-F80**		Setting distance Measurable thickness Resolution Linearity Head size	80 to 81.1 mm 0.05 to 1.1 mm 0.001 µm ±0.2 µm ø12 mm

Sensor head

Micro-head type
SI-F01

Long distance type
SI-F10

Thickness measurement type
SI-F80

Spectrum unit
SI-F01U/
SI-F10U/
SI-F80U

(One spectroscopic unit is needed for each sensor head.)

Optional unit

Head mounting jig (For SI-F01)
OP-84480

Controller

Single unit type
SI-F1001V

Separate type
SI-F1001

Expansion controller
SI-FA100

Back surface

Spectrum unit spacer
OP-84474

(Supplied together with the spectroscopic unit)

Display

Display panel
SI-FD500

Cable

Controller-to-sensor head unit connecting cable
CB-A07/CB-A2/CB-A5/
CB-A10/CB-A20/CB-A30

Controller-to-spectrum unit extension cable
CB-A5E/CB-A10E
Display-to-controller cord
0.33 m: **OP-84428**
3 m[1]: **OP-51655**
10 m: **OP-51656**

Software

Dedicated PC software "SI-Navigator"
SI-H1

Specifications

Sensor head

Type			Micro-head type	Long distance type	Thickness measurement type
Model	Sensor head		**SI-F01**	**SI-F10**	**SI-F80**
	Spectrum unit		**SI-F01U**	**SI-F10U**	**SI-F80U**
Measurement range			0.05 to 1.1 mm *1	11.3 to 12.35 mm *1	0.05 to 1.1 mm *2 (Possible detection distance : 80 to 81.1 mm)
Light source			Infrared SLD Central wavelength 820 nm Output 0.6 mW, Class 1 Laser product (IEC60825-1, FDA (CDRH) Part 1040.10 *8)		
Beam spot diameter*3			ø20 µm	ø40 µm	ø20 µm
Linearity			±0.2 µm *4	±0.3 µm *4	±0.2 µm *5
Resolution			0.001 µm *6	0.01 µm *6	0.001 µm *7
Sampling cycle			200 µs		
Light source for guide			Red semiconductor laser Wavelength 650 nm Output 0.1 mW, Class 1 Laser product (IEC60825-1, FDA (CDRH) Part 1040.10 *8)		
LED display			Target near centre of measurement range: green lights. Target within measurement range: orange lights. Target outside measurement range: Flashes orange.		
Temperature fluctuation	Spectrum unit		0.01% of F.S./°C		
Environment resistance	Enclosure rating	Sensor head	IP67	IP64	IP64
	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.		
	Ambient temperature	Sensor head	0 to +85°C	0 to +40°C	0 to +50°C
		Spectrum unit	0 to +35°C		
	Relative humidity	Sensor head	35 to 85%RH (No condensation)		
		Spectrum unit	35 to 80%RH (No condensation)		
	Vibration	Sensor head	10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively		
		Spectrum unit	10 to 55 Hz, 0.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively		
Material	Sensor head		SUS		
	Spectrum unit		Polycarbonate		
Weight	Sensor head (including cable)		Approx. 24 g	Approx. 38 g	Approx. 39 g
	Spectrum unit		Approx. 1 kg		

*1 Indicates distance from the front of the sensor head. For long distance type sensor heads there is an individual difference of up to ±0.2 mm.
*2 The thickness measurement type sensor head displays the measurement range for the distance between plates of glass. Ensure that the measurement target is within the possible detection distance range.
*3 Indicates the minimum beam spot diameter within the measurement range.
*4 This value is obtained when the measurement target is a glass plate with the number of averaging measurements set to 256.
*5 This value is obtained by measuring the gap between two glass plates with the number of averaging measurements set to 256.
*6 This value is obtained by measuring a glass plate surface located at the centre of the measurement range with the number of averaging measurements set to 4,096.
*7 This value is obtained by measuring a 0.3 mm thick glass target within the possible detection distance with the number of averaging measurements set to 4,096.
*8 The laser classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No. 50.

Controller

Type			Main Controller	Expansion controller*1
Model	Single unit type		**SI-F1001V**	**SI-FA100**
	Separate type*2		**SI-F1001/SI-FD500**	
No. of connectable spectrum units			2	1
Display	Minimum display unit		0.001 µm	N/A
	Display range		±999.999 µm to ±9999.99 mm, (7 settings selectable)	
	Display cycle		10 times/sec.	
Terminal block	Laser remote interlock input		Non-voltage input	N/A
	TIMING1 input			
	RESET1 input			
	Auto-zero1 input			
	Laser control input			
	Analogue voltage output		±10 V x 2 outputs, Output impedance: 100 Ω	±10 V x 1 output, Output impedance: 100 Ω
	Analogue current output		4 to 20 mA x 2 outputs, Maximum load resistance: 350 Ω	4 to 20 mA x 1 output, Maximum load resistance: 350 Ω
	Alarm output		NPN open-collector output (N.C.)	N/A
	General comparator output		NPN open-collector output	
Expansion connector	TIMING input		Non-voltage input 2	N/A
	RESET input		Non-voltage input	
	Auto-zero input			
	Program switch input		Non-voltage input x 3 inputs	
	Alarm output		NPN open-collector output (N.C.)	
	Comparator/ binary output	Binary output	Measured value data output (21 bits) OUT selectable NPN open-collector output	
		Strobe output	NPN open-collector output	
		Binary selection output	NPN open-collector output	
		Binary selection input	Non-voltage input	
RS-232C interface			Measured data output and control input/output (Baud rate selectable to 115,200 bps max.)	N/A
USB interface			USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible)	
Ethernet interface			100Base-TX/10Base-T	
Major functions			12 Out simultaneous measurement calculation, average, filter, scaling measurement, measured value alarm, tolerance setting, auto-zero, data storage, light monitor, 8-program memory, interferometer mode, mask, connection of setting support software, etc.	
Power supply	Power supply voltage		24 VDC±10% Ripple 10% (P-P) max.	Supplied from the main controller
	Maximum current consumption		One head connected: 0.6 A or less. Six heads connected: 1.5 A or less.	
Environment resistance	Ambient temperature*3		0 to +50°C	
	Relative humidity		35 to 85%RH (No condensation)	
	Vibration*4		10 to 55 Hz, 0.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively	
Weight			Approx. 600 g	Approx. 300 g

*1 Up to four expansion controllers can be connected to the main controller.
*2 The SI-F1001 can be used independently. The measured value display and setting change can be done with the display panel (SI-FD500) and setup support software (SI-H1).
*3 When two or more expansion controllers are connected, the ambient temperature is 0 to 40°C
*4 When two or more expansion controllers are connected, the vibration resistance is "10 to 55 Hz, 0.3 mm double amplitude in X, Y, and Z directions, 2 hours respectively".
• NPN open-collector output rating: 50 mA max. (40 V max.), Residual voltage: 0.5 V max.
• Non-voltage input rating: ON voltage: 1 V max., OFF current: 0.6 mA max.
• Part of the input/output circuit of the SI Series is internally common. Be careful that no potential difference is generated between the internally common terminals due to the potential difference between the cables/external devices. For details, refer to "Precautions on wiring".

Operating environment required to use SI-H1 (SI-Navigator)

Item	Minimum system requirements
CPU	Pentium III, 1 GHz or higher (1.7 GHz or higher is recommended)
OS	Windows 7*1/ Windows Vista*2/ Windows XP*3/ Windows 2000 Professional*4
Memory capacity	256 MB or higher (1 GB or more is recommended)
Display resolution	1024 x 768 pixels, 24-bit full colour or higher
Free hard disk space	1 GB or larger
Interface	One of the following interfaces is required. - USB: Revision 2.0, high-speed (full speed in USB1.1 compatible mode)*5 - LAN: 100BASE-TX or 10BASE-T*6 - RS-232C (serial port)

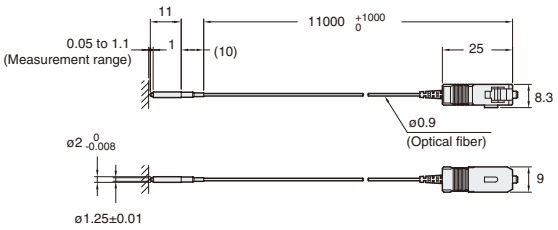
The other system requirements must meet those recommended for your OS.
*1 Home Premium, Professional and Ultimate editions are supported.
*2 Ultimate, Business, Home Premium and Home Basic editions are supported.
*3 Professional SP2 and later versions and Home Edition SP2 and later versions are supported.
*4 SP4 and later versions are supported.
*5 Connections via a USB hub are not supported.
*6 Connections via an in-house LAN or a router are not supported. Direct or local connections must be used.
* Windows is a registered trademark of Microsoft Corporation.
* Pentium is a registered trademark of Intel Corporation.

Dimensions

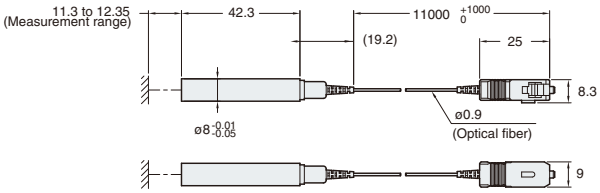
Unit: mm

Sensor head

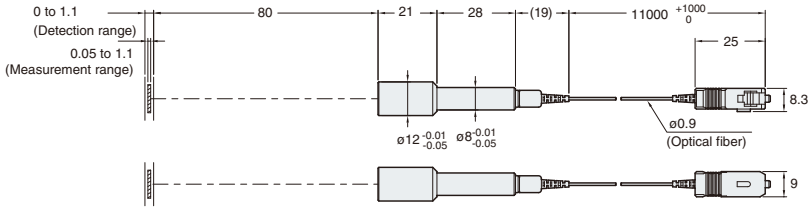
Micro-head type
SI-F01



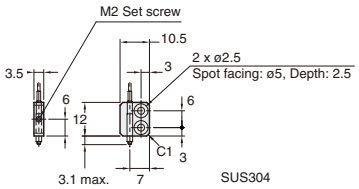
Long distance type
SI-F10



Thickness measurement type
SI-F80

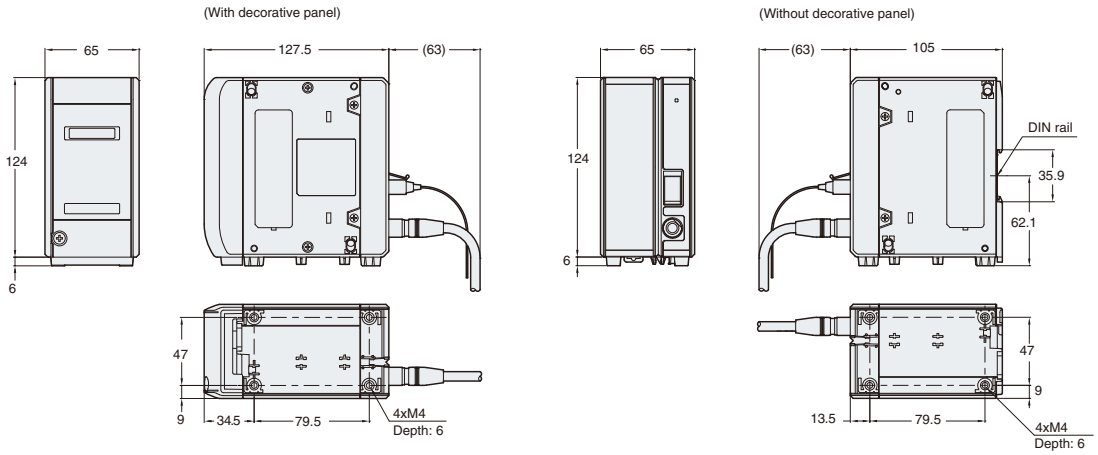


Head mounting jig (For SI-F01)
OP-84480



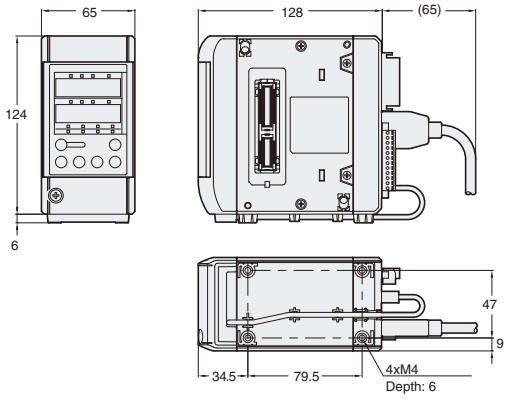
Spectrum unit

SI-F01U/SI-F10U/SI-F80U

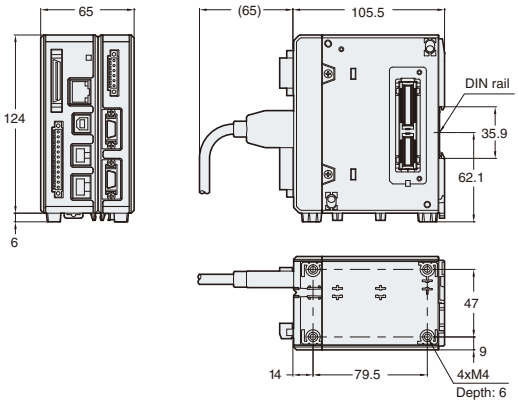


Controller

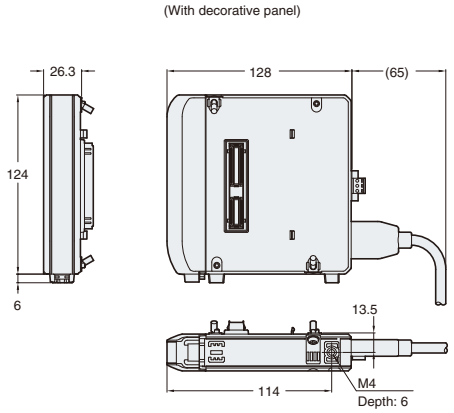
Single unit type
SI-F1001V

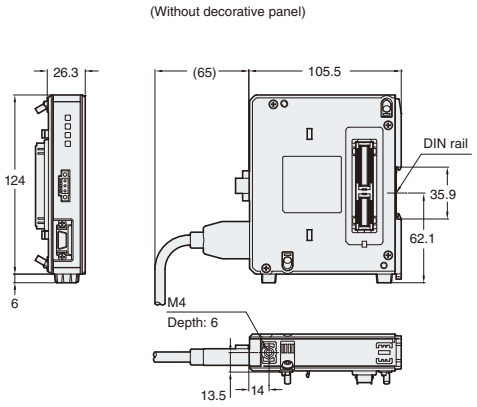


Separate type
SI-F1001



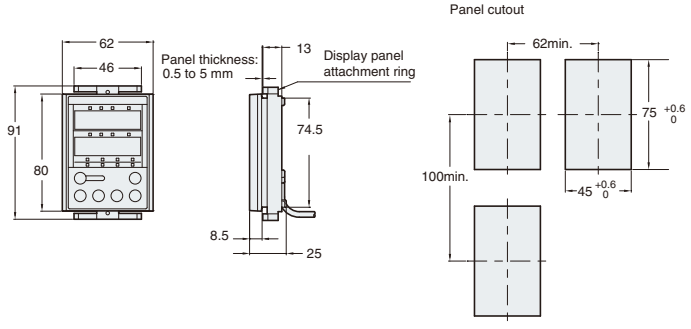
Expansion controller
SI-FA100





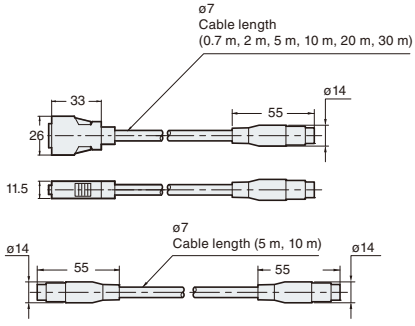
Display

Display panel
SI-FD500



Additional accessories

Controller-to-spectroscopic unit connection cable
CB-A07/CB-A2/CB-A5/CB-A10/
CB-A20/CB-A30

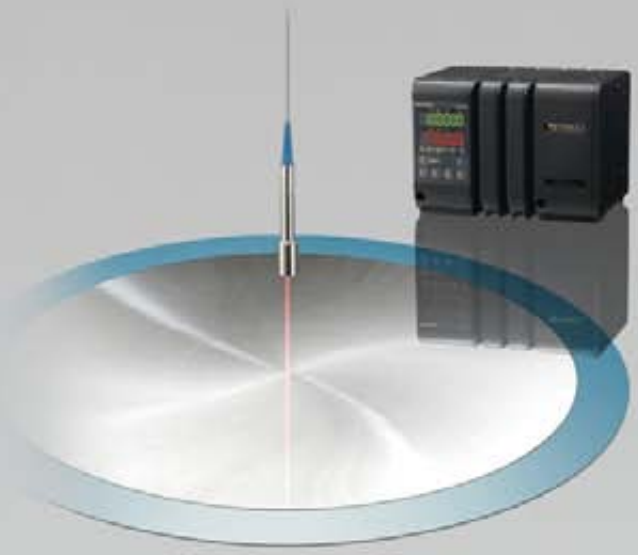


Spectral-Interference Wafer Thickness Meter

NEW

SI-F80R Series

CE



Features

- Resolution of 0.001 µm
- Sampling speed of 5 kHz
- Working distance 80mm

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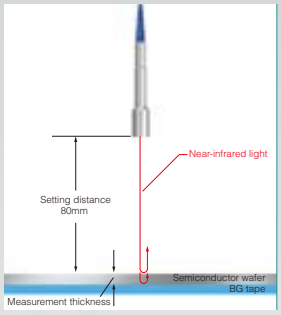
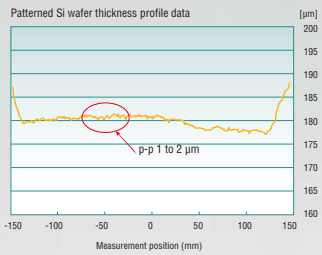
Accurately measure wafer thickness

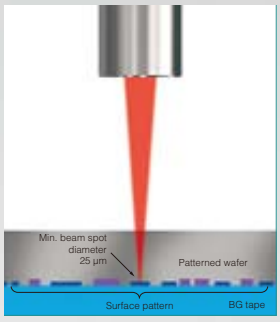
The SI-F80R Series employs a near-infrared SLD that can penetrate through Si, GaAs, SiC, InP, a-Si, and other semiconductors. It can accurately measure wafer thickness, even when covered with BG (backgrind) tape.



Not influenced by wafer patterns

Variations from wafer surface patterns and measurement alarms can be held to a minimum by decreasing the spot beam diameter and surface aberrations inside the beam spot.



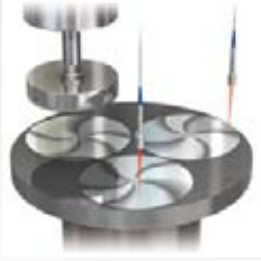


Simple, accurate measurements next to the line

- The sensor can easily make measurements just by being positioned 80 mm from wafers.
- Non-contact, so wafers are not damaged.
- The sensor can directly measure just wafer thickness, so measurements are not influenced by BG tape thickness.

Constant monitoring in process

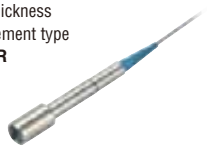
- With a small head that can be installed 80 mm from the wafer, wafer thickness can be constantly monitored inside equipment while polishing.



Lineup

Components

Sensor head
Wafer thickness measurement type
SI-F80R



Spectrum unit
SI-F80RU

External device

IR sensor card

Specifications

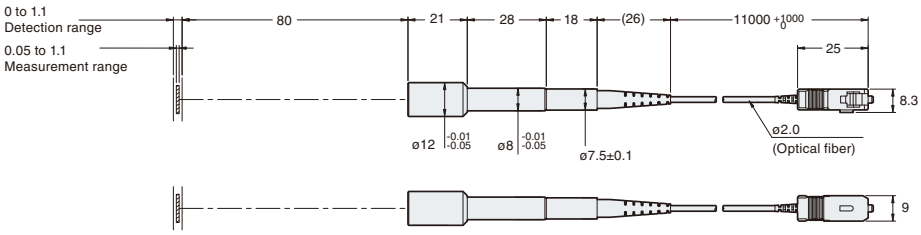
Type			Wafer thickness measurement type
Model	Sensor head		**SI-F80R**
	Spectrum unit		**SI-F80RU**
Measurement range *1			10 to 310 µm (when n=3.5)
Possible detection distance			80 to 81.1 mm
Light source			Infrared SLD Output 0.6 mW, Class 1 Laser Product (IEC60825-1, FDA (CDRH) Part 1040.10 *5)
Beam spot diameter *2			ø25 µm
Linearity *3			±0.1 µm (when n=3.5)
Resolution *4			1 nm
Sampling cycle			200 µs
LED display			Target near centre of measurement range: green lights. Target within measurement range: orange lights. Target outside measurement range: flashes orange.
Temperature fluctuation	Spectrum unit		0.01% of F.S./°C
Environment resistance	Enclosure rating	Sensor head	IP64
	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.
	Ambient temperature	Sensor head	0 to +50°C
		Spectrum unit	0 to +35°C
	Relative humidity	Sensor head	35 to 85% RH (No condensation)
		Spectrum unit	35 to 85% RH (No condensation)
	Vibration	Sensor head	10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively
		Spectrum unit	10 to 55 Hz, 0.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively
Material	Sensor head		SUS
	Spectrum unit		Polycarbonate
Weight	Sensor head (including cable)		Approx. 70 g
	Spectrum unit		Approx. 1.2 kg

The sensor head and spectrum unit are calibrated as a pair. They are not interchangeable.
*1 Indicates the thickness measurement range when the refractive index is 3.5. (The thickness measurement range is 35 to 1100 µm when the refractive index is 1.)
*2 Indicates the minimum beam spot diameter within the measurement range.
*3 This value is obtained by measuring the gap between two glass plates with the number of averaging measurements set to 256, converted to a refractive index of 3.5.
*4 This value is obtained by measuring a 0.3 mm thick glass target within the possible detection distance with the number of averaging measurements set to 4096.
*5 The laser classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No. 50.

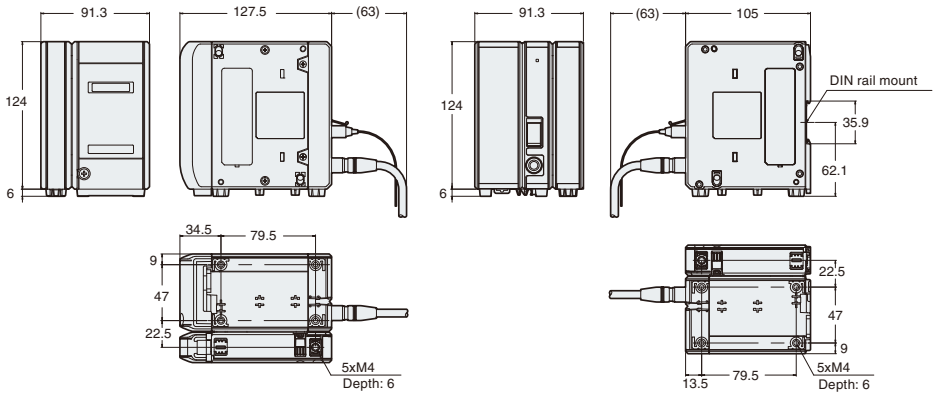
Dimensions

Unit: mm

SI-F80R



SI-F80RU



Surface Scanning Laser Confocal Displacement Meter

LT-9000 Series

CE

Features

- Precise 2 µm diameter beam spot
- 0.3 µm resolution

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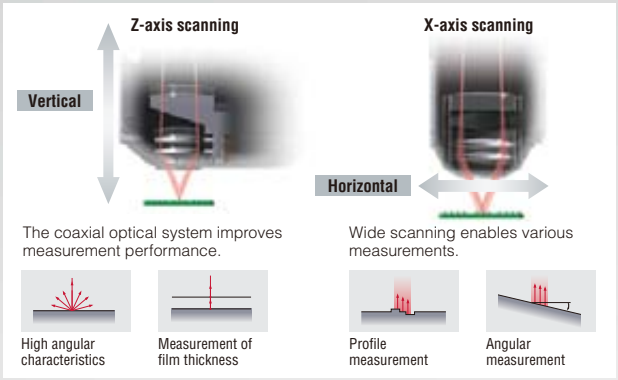
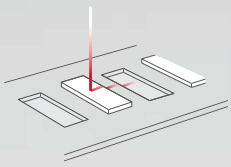
The surface scanning method allows measurements of all types of targets

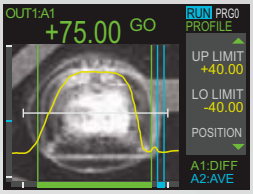
A tuning fork unit and oscillation unit are combined to create a surface scanning laser. This results in advanced displacement and profile measurements that are unaffected by target colour or angle.



Profile measurement NEW

The surface profile can be traced accurately using the oscillation unit.

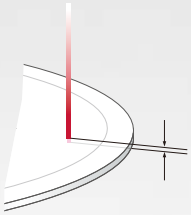




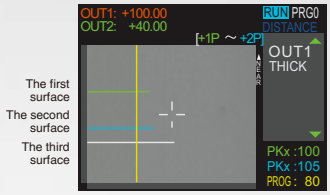
The surface profile can be traced using the double-scanning method. The height difference between the two points can be measured.

Transparent object thickness measurement

The surface condition and thickness of transparent objects can be measured stably by utilizing the confocal principle.

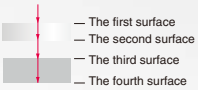


The thickness of transparent disks can be measured. In addition, the slant correction function enables more reliable measurements.



Multi-surface measurement function

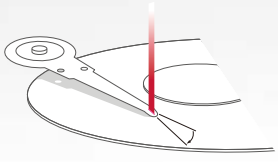
NEW



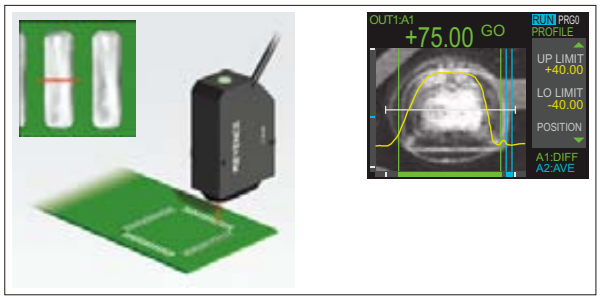
The peak value of light intensity of up to four target surfaces can be detected with one measurement unit. The selected measurement surface can be measured with high accuracy.

Angle measurement NEW

An angle can be measured in increments of 0.01 degrees based on the measurement values of two or more points obtained by scanning the laser beam spot.

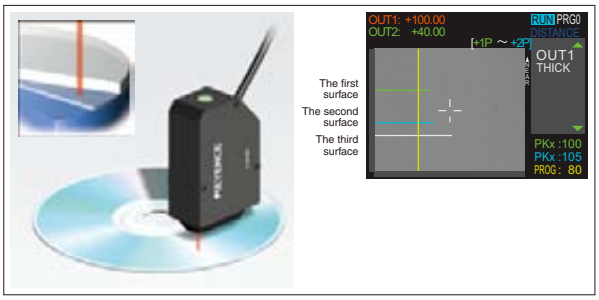


Applications



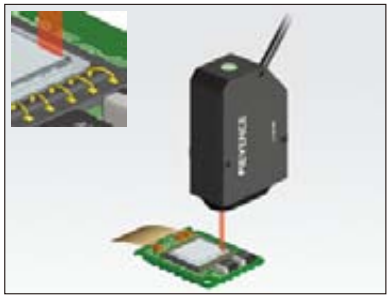
Measuring the profile of solder paste on a PWB

The profile of lead-free solder can be measured for detecting abnormalities such as cracks, bridges, and insufficient soldering.



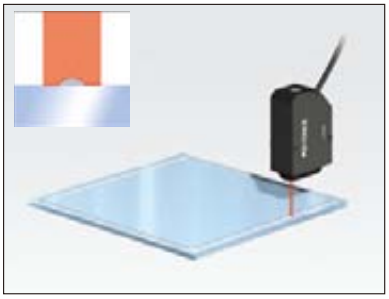
Measuring the thickness of an optical disc

The intermediate layer of an optical disc can be measured.



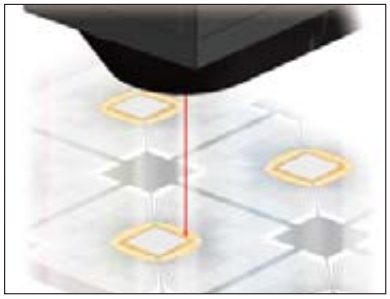
Measuring the parallelism of a CCD and cover glass

The inclination of a CCD surface against the rear surface of the glass can be measured accurately using the newly developed relative angle measurement.



Measuring the cross-sectional area of liquid sealing material

The profile and cross-sectional area of sealing material applied for bonding glass substrates.



Measuring the height of wire

The height of narrow pitch bonding wire can be measured reliably.

Lineup (Measuring unit)

Type	High-accuracy	Long-range
Model	**LT-9011M**	**LT-9031M**
Measurement range	±0.3 mm	±1 mm
Reference distance	6 mm	30 mm
Appearance		
Scan width	0 to 1100 µm (6 steps)	0 to 560 µm (6 steps)
Interval	1 to 10 µm (4 steps)	1 to 8 µm (4 steps)
Resolution	0.3 µm	0.3 µm
Linearity	±0.5% of F.S.	±0.3% of F.S.

Specifications

Controller

Model	Controller		**LT-9501H/LT-9001H**	**LT-9501HSO(5654)/LT-9001HSO(5655)**
	Measuring unit		**LT-9011M/LT-9011**	**LT-9031M/LT-9031**
Measuring unit compatibility			Measuring units are interchangeable without factory recalibration.	
Display	Minimum display unit		0.1 µm*5 , 1 µm², 0.01°	0.1 µm*5
	Display range		±9999.99 µm, ±999999 µm², 9999.99°	±9999.99 µm
	Microscope function		Available (LT-9501H/LT-9011M only)	Available (LT-9501HSO(5654)/LT-9031M only)
	Display cycle*1		10 times/sec.	
Terminal block	Analogue output		±10 V x 2 outputs, output impedance: 100 Ω	
	Timing input/Reset input/Auto-zero input		Non-voltage input	
	Monitor dedicated power supply*2		24 VDC, 1 A	
Control I/O	Limits mode*3	3-step limits output	For OUT1 and OUT2, and NPN open collector output	
	Binary mode*3	Binary output	Measured data output (21 bits), OUT1/OUT2/PROFILE selectable NPN open collector output	
		Strobe output	NPN open collector output	
		Binary selection output	NPN open collector output	
		Binary selection input	Non-voltage input	
	Stability output		NPN open collector output	
	Laser remote input		Non-voltage input	
	Program change input		Non-voltage input x 3 inputs	
RS-232C interface			Measured data output and control I/O (Selectable up to baud rate 115200 bps.)	
Video output			NTSC compliant (PIN connector)	
Main function	Distance mode*4		Distance measurement, Transparent object thickness measurement, Angle measurement, Relative angle measurement, Surface selection, Dark-out, Mask, Trend graph display, and Scan width/interval change	Distance measurement, Transparent object thickness measurement, Surface selection, Dark-out, Mask, Trend graph display, and Scan width/interval change
	Profile mode*4		Area selection (Average, Maximum, Minimum, Maximum-to-minimum, Area) Area calculation, Scan width/interval change, Dark-out, Smoothing, Averaging, and Profile data output	–
	Common		Light intensity accumulation, Microscope (LT-9501H, LT-9501HSO(5654) only), Tolerance judgment, 8-program registration, Calibration, Averaging, Hold modes, Auto-zero, and interface language selection	
Rating	Power supply voltage		100 to 240 VAC ±10% 50/60 Hz	
	Current consumption		110 VA or lower	
	Overvoltage category		II	
	Pollution degree		2	
Ambient temperature			0 to 35°C, No condensation	
Relative humidity			35 to 85%, No condensation	
Weight (Controller)			Approx. 2.4 kg	

*1 Varies depending on the setting
*2 Dedicated power supply for the monitor specified by KEYENCE.
*3 Select either the Limits mode or the Binary mode.
*4 Select either the Distance mode or the Profile mode. (Distance mode is only available with the LT-9501HSO(5654) and LT-9001HSO(5655).)
The rating of the NPN open-collector output is 30 mA (30 V or lower) maximum, and residual voltage is 0.5 V.
The rating of the Non-voltage input is ON voltage 1 V or lower, and OFF current 0.6 mA or lower.
*5 Display changes every ±0.3 µm.

Measuring unit

Type		High-accuracy		Long-range	
Model		**LT-9011M**	**LT-9011**	**LT-9031M**	**LT-9031**
Measurement range		±0.3 mm		±1.0 mm	
Reference distance		6 mm		30 mm	
Light source		Red semiconductor laser			
	Wavelength	670 nm			
	Output	170 µW (IEC 60825-1)/3.0 µW (FDA (CDRH) Part 1040.10)			
	Laser Class	Class IIa Laser Product (FDA (CDRH) Part 1040.10) Class 1 Laser Product (IEC 60825-1)			
Spot diameter		Approx. ø2 µm		Approx. ø7 µm	
Scan width/interval		0 to 1100 µm (6 steps)/ 1 to 10 µm (4 steps)		0 to 560 µm (6 steps)/ 1 to 8 µm (4 steps)	
Resolution*1		0.3 µm		0.3 µm	
Linearity*1		±0.5% of F.S.		±0.3% of F.S.	
Sampling cycle*2		640 µs to 356 ms (14 steps)		640 µs to 187 ms (14 steps)	
Temperature characteristics (20 to 30°C)		±0.5% of F.S.		±0.25% of F.S.	
Microscope function		Available	Unavailable	Available	Unavailable
	Field of view	1.3 mm x 1.05 mm	–	2.5 mm x 2.0 mm	–
	Illumination light source	Infrared LED (wavelength: 870 nm)	–	Infrared LED (wavelength: 870 nm)	–
Ambient light		Incandescent lamp/fluorescent lamp: 10000 lux max.			
Ambient temperature		0 to 35°C, No condensation			
Relative humidity		35 to 85%, No condensation			
Weight		Approx. 400 g		Approx. 500 g	

*1 The value when the measurement target is a mirrored surface object measured in displacement mode, scan width/interval 120 µm/2 µm, and 8-times average
*2 Sampling cycle differs according to the manufacturing variation of individual measuring units.
The value when the FINE mode is set to OFF.

Cable between the sensor head and controller (Extension cable)

Model	**LT-C2**	**LT-C10**
Cable length	2 m	10 m
Weight	Approx. 200 g	Approx. 700 g

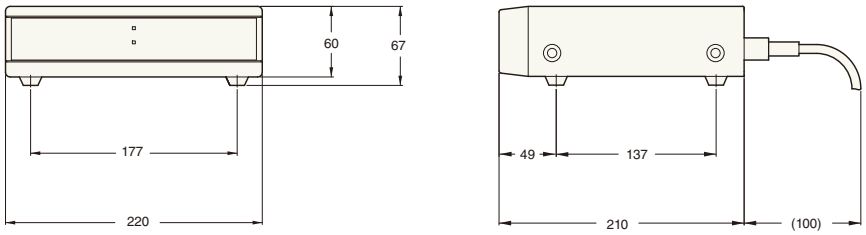
* Up to 3 cables can be connected with a total maximum length of 20 m.

Dimensions

Controllers

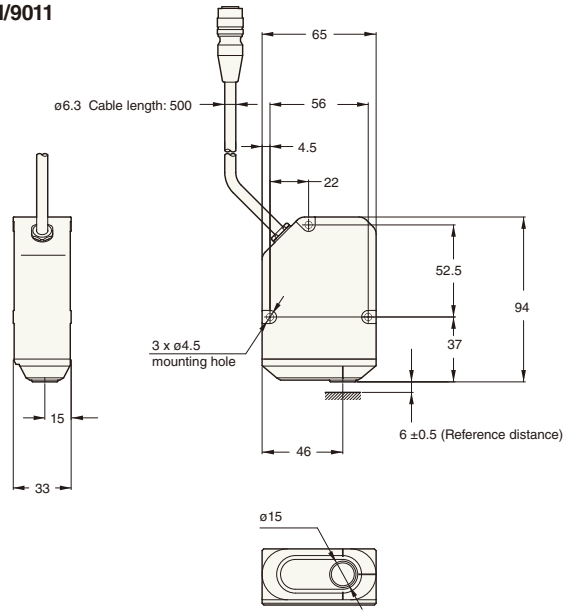
Unit: mm

LT-9501H/9001H, LT-9501HSO(5654)/9001HSO(5655)

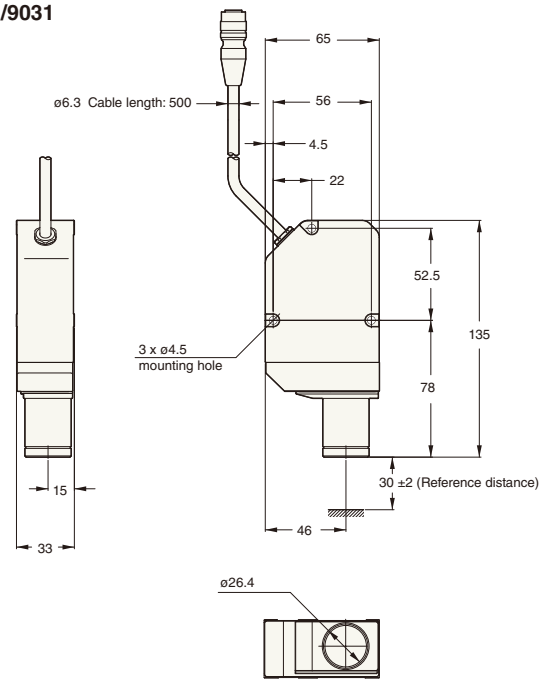


Measuring units

LT-9011M/9011



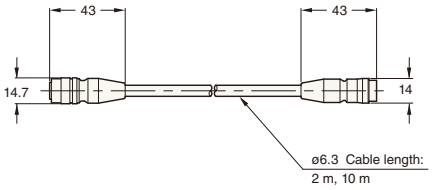
LT-9031M/9031



Extension cable

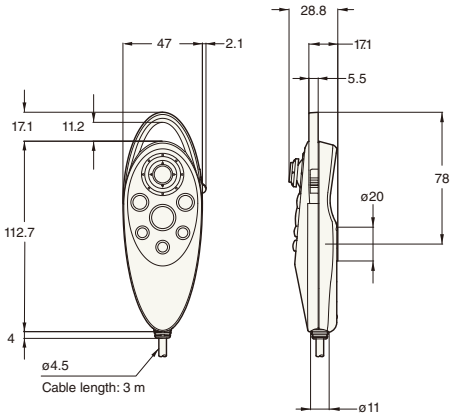
Cable between the measuring unit and the controller

LT-C2/LT-C10



Remote control console

(Standard **OP-51542**)



CCD Optical Micrometer

LS-7000 Series

CE

Features

- High repeatability 0.06 µm
- High speed 2400 samples/second
- Maintenance-free design

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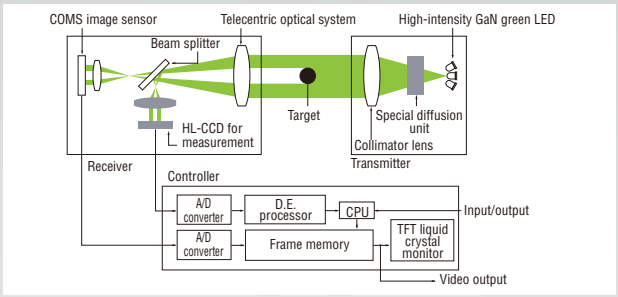
Optical System Achieving High-speed, High-accuracy, and High-durability

Speed, accuracy, and durability have been improved by advanced optical technology, using a high-intensity Green LED, a telecentric lens, and the HL-CCD in the receiver.



Principle diagram of the LS-7000 Series

The green LED light is distributed as a uniform, collimated beam and is applied to a target. The edge between the bright and dark area on the CCD is detected and used to calculate a measured value, such as an outer diameter.

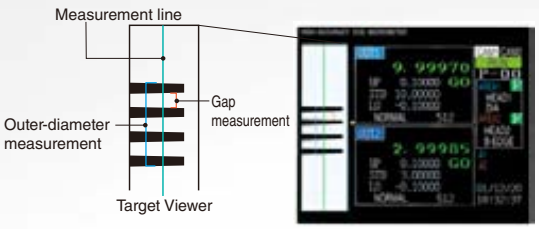
Excellent repeatability of ±0.06 µm, 4 times better than conventional systems

By using LED and CCD technologies, repeatability is four times greater than with a conventional laser scan micrometers.

Easy operation and quick inspection

Target viewer for easy position adjustment

The sensor incorporates a CMOS monitor camera to capture a real-time image of a target. Measurement conditions can be checked on the LCD monitor. The target viewer function allows the optical axis to be aligned exactly with the desired measurement point, even if a target has a complicated shape or is very small.
The measuring area for the current measurement mode is displayed in real time. (LS-7070M/LS-7030M/LS-7010M)



High-durability

Best in its class

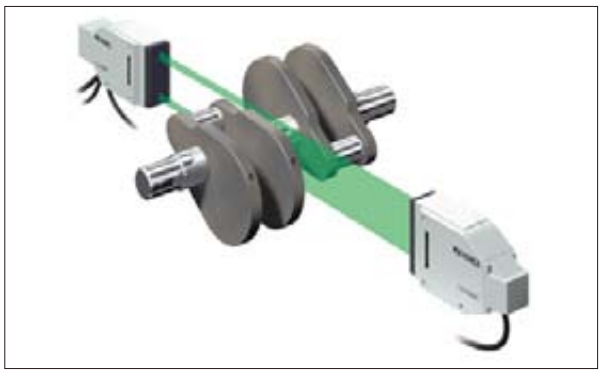
CCD without moving parts & Long-life LED

The laser scan method was reviewed thoroughly. Resulting in the combination of Green LED and HL-CCD that solved the problem of motor durability, which had been the weak point of the laser-scanning method. Furthermore, the long-life LED achieved continued reliability over the long term.

HL-CCD

Green LED

Applications



Measuring the deflection of a crank journal

Measuring the width of a sheet

Measuring the outer diameter of a wafer

Measuring the outer diameter of a catheter

Lineup

Measuring head

Type	Wide range		Standard		Super fine	
	With monitor	No monitor	With monitor	No monitor	With monitor	No monitor
Model	**LS-7070M**	**LS-7070**	**LS-7030M**	**LS-7030**	**LS-7010M**	**LS-7010**
Appearance						
Measuring range	0.5 to 65 mm		0.3 to 30 mm		0.04 to 6 mm	
Measurement accuracy	±3 µm		±2 µm		±0.5 µm	
Repeatability	±0.2 µm		±0.15 µm		±0.06 µm	

Controller

Type	High-performance	Standard
Model	**LS-7601**	**LS-7001**
Appearance		
Measurement indicator	Monitor display	Red LED 7-level display

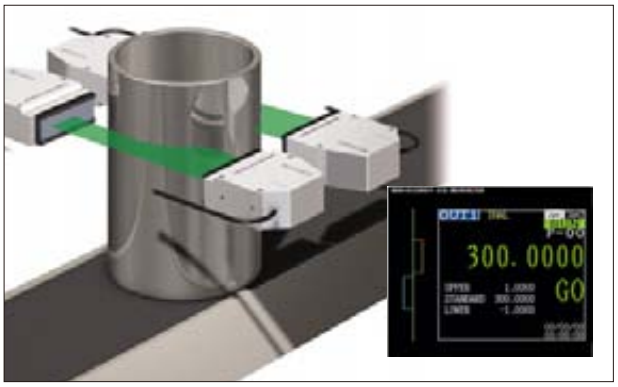
Function

Dual-head mode

Newly-developed

Measuring the outer diameter of a metal pipe

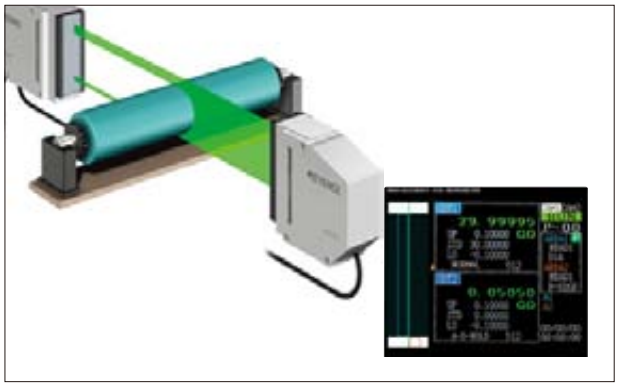
This simple, special mode measures large diameter targets or wide sheet materials. Complicated calculations or other settings are unnecessary.



One-head simultaneous measurement

Measuring both the outer diameter and eccentricity of a copy roller simultaneously

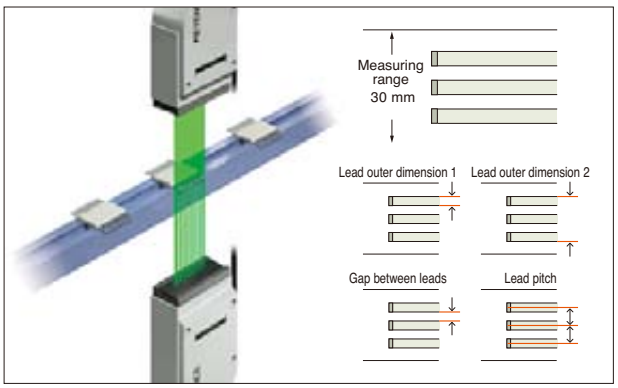
One measuring head allows simultaneous measurement using two measurement modes, such as measuring the outer diameter and eccentricity.



Measuring area designation

Measuring IC lead pitch

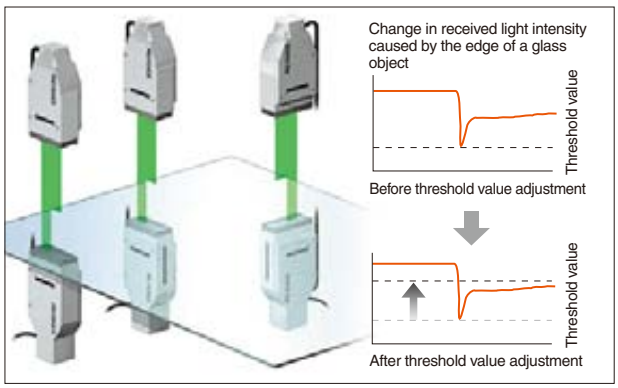
The measuring area can be designated according to the inspection purpose, such as measurement of the IC lead gap or pitch.



Transparent object measurement

Checking the width or edge position of a glass plate

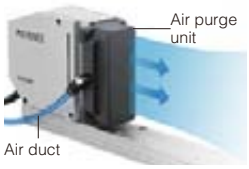
Even transparent objects that were difficult to detect with conventional micrometers can be measured. The edge detection level can be easily changed via the controller.


Change in received light intensity caused by the edge of a glass object
Threshold value
Before threshold value adjustment
Threshold value
After threshold value adjustment

Air purge unit (Optional) & IP64 Rating

OP-79428 [for LS-7030 (M)]
OP-79429 [for LS-7070 (M)]

Attaching the air purge unit in front of the measuring head and feeding an air flow prevents dirt or dust from accumulating on the head surface.



Controller-compatible IP64 head

The head stores compensation data to ensure compatibility with the controller. This greatly improves measurement accuracy and head maintainability.
In addition, the measuring head conforms to IP64. It is drip-proof and suitable for harsh environments.

Specifications

Controller

Type			High-performance	Standard
Model			**LS-7601**	**LS-7001**
Appearance				
No. of connectable measuring heads			2 (All types)	2 (LS-7070/LS-7030/LS-7010 only)
Display	Measurement display		TFT 5.5-inch LCD display, Backlight: CCFL (Average life: 40,000 hours)	Main display: 7-segment red LED (Character height: 20.3 mm) Sub-display: 7-segment red LED (Character height: 9.9 mm) x 3
	Minimum display unit		0.01 µm to 100 µm (7-level selectable)	
	Display range		±99.99999 to ±9999.9 mm (Linked to minimum display unit setting, mm/inches selectable)	
	Measurement position monitor		Monitor image (When the measuring head with the monitor function is connected.)	7-level display with a red LED
	Tolerance check output display		5-level LCD indicator	Green LED (GO), Red LED x 2 (HI, LO)
Terminal block	Alarm output		NPN open-collector output (N.C.)	
	5-level comparator output		NPN open-collector output for OUT1	
	Comparator ready output			
	Strobe output			
	Synchronous input		Non-voltage input for OUT1	
	Reset input			
	Auto-zero input			
	Program selection input		Non-voltage input x 4 inputs	
	Statistical processing input		Non-voltage input for OUT1	—
	Analogue output		±10 V x 2 outputs	
Connector I/O	SUB mode*1	5-level comparator output	NPN open-collector output for OUT2	
		Comparator ready output		
		Strobe output		
		Statistical processing output	NPN open-collector output x 2 outputs	—
		Function output	Selectable from focus, area check, and difference check, NPN open-collector output x 2 outputs	
	BCD mode*1	BCD output	Measurement data output (Sign + 7 digits), OUT1/OUT2 selectable, NPN open-collector output	
		BCD selection output	NPN open-collector output	
		BCD selection input	Non-voltage input	
	Synchronous input		Non-voltage input for OUT2	
	Reset input			
	Auto-zero input			
	Statistical processing input		Non-voltage input for OUT2	—
RS-232C interface			Measurement data output and control I/O, printer (Baud rate can be selected up to 115.200 bps)	
Video output			Conforming to the NTSC system (RCA connector)	—
Power supply voltage*2			24 VDC ±10%	
Current consumption*2			1.2 A max.	0.7 A max.
Enclosure rating			IP64 (Panel surface only)	
Ambient temperature			0 to 40°C	
Relative humidity			35 to 85%, No condensation	
Weight			Approx. 1010 g	Approx. 820 g

*1 Either SUB mode or BCD mode can be selected.
*2 AC power supply can be used when the LS-S11 (AC power supply stand) is connected.
The rating of the NPN open-collector inside the terminal block is: 100 mA max. (40 V max.), with a residual voltage of 0.5 V max. The rating of the NPN open-collector inside the connector I/O is: 30 mA max. (30 V max.), with a residual voltage of 0.5 V max. The rating of non-voltage input is: ON voltage of 1 V max., OFF current of 0.6 mA max.

Specifications

Measuring head

Type	Large-diameter type		Wide measurement range		Super fine measurement	
Monitor camera	Provided	Not provided	Provided	Not provided	Provided	Not provided
Model	**LS-7070M**	**LS-7070**	**LS-7030M**	**LS-7030**	**LS-7010M**	**LS-7010**
Appearance						
Measuring range	0.5 to 65 mm		0.3 to 30 mm		0.04 to 6 mm	
Smallest detectable object	0.5 mm		0.3 mm		0.04 mm	
Transmitter/receiver distance	250 ±50 mm		160 ±40 mm		60 mm	
Light source	GaN green LED					
CCD scanning range	Approx. 69 mm		Approx. 33 mm		Approx. 7 mm	
Measurement accuracy	±3 µm*1		±2 µm*3		±0.5 µm*5	
Repeatability	±0.2 µm*2		±0.15 µm*4		±0.06 µm*6	
No. of samples*7	2,400 samples/sec.					
Monitor function	Provided	Not provided	Provided	Not provided	Provided	Not provided
Enclosure rating*8	IP64					
Ambient temperature	0 to 50°C					
Relative humidity	35 to 85%, No condensation					
Weight	Transmitter: Approx. 540 g, Receiver: Approx. 770 g, Base: Approx. 660 g	Transmitter: Approx. 540 g, Receiver: Approx. 730 g, Base: Approx. 660 g	Transmitter: Approx. 420 g, Receiver: Approx. 570 g, Base: Approx. 430 g	Transmitter: Approx. 420 g, Receiver: Approx. 470 g, Base: Approx. 430 g	Transmitter: Approx. 140 g, Receiver: Approx. 380 g, Base: Approx. 220 g	Transmitter: Approx. 140 g, Receiver: Approx. 340 g, Base: Approx. 220 g

*1 The error when a moving rod 20 mm in diameter is measured in the measuring area of 20 x 40 mm.
*2 The value of ±2σ when the outer diameter of a rod 20 mm in diameter is measured at the centre of the measuring area while the number of averaging measurements is set to 512.
*3 The error when a moving rod 10 mm in diameter is measured in the measuring area of 10 x 20 mm.
*4 The value of ±2σ when the outer diameter of a rod 10 mm in diameter is measured at the centre of the measuring area while the number of averaging measurements is set to 512.
*5 The error when a moving rod 1.0 mm in diameter is measured in the measuring area of 2 x 4 mm.
*6 The value of ±2σ when the outer diameter of a rod 1.0 mm in diameter is measured at the centre of the measuring area while the number of averaging measurements is set to 512.
*7 1200 samples/sec. when the mutual interference prevention function is used.
*8 The connector section is excluded.

Hardware environment for the LS-H1W (LS-Navigator)

Model	**LS-H1W**
CPU	Pentium III, 400 MHz or higher
Supported OS	Windows 7 *1/Windows Vista *2/Windows XP Professional Edition/ Home Edition/Windows 2000 Professional
Memory capacity	128 MB or more
Display	XGA (1024 x 768 pixels) or greater, 256 colours or greater
Hard disk space	30 MB or more
Interface	RS-232C (Serial port)

• Windows is a registered trademark of Microsoft Corporation of America.
• Pentium is a registered trademark of Intel Corporation.
*1 Home Premium, Professional and Ultimate editions are supported.
*2 Ultimate, Business, Home Premium, Home Basic editions are supported. For Windows Vista, Ver. 1.6 and later versions are supported.

AC power supply stand LS-S11

Model	**LS-S11**
Applicable controller	**LS-7001/LS-7601**
Power supply voltage	100 to 240 VAC ±10%, 50/60 Hz
Current consumption	110 VA max.
Ambient temperature	0 to 40°C
Relative humidity	35 to 85%, No condensation
Weight	Approx. 1.7 kg

Extension cables

Model	Cable length
Cable between the controller and measuring head	
LS-C3A	3 m
LS-C10A	10 m
LS-C30A	30 m
Camera cable between the controller and measuring head	
LS-C3AM	3 m
LS-C10AM	10 m
LS-C30AM	30 m
Cable between the receiver and transmitter	
OP-42182	1 m
OP-42183	3 m

Options

AC power supply stand
LS-S11

Air purge unit
OP-79428
[For LS-7030(M)]

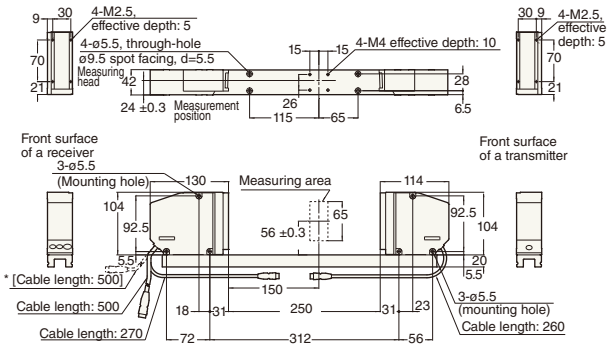
Air purge unit
OP-79429
[For LS-7070(M)]

Dimensions

Measuring heads

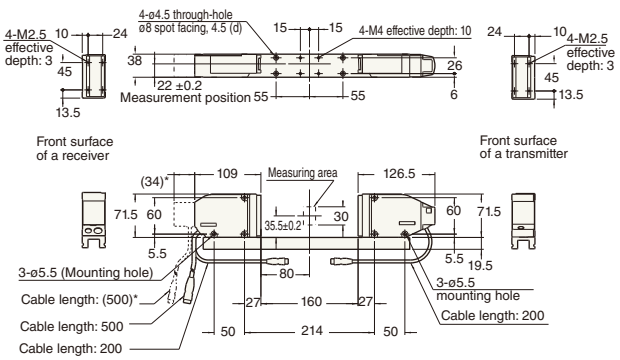
Unit: mm

LS-7070 (LS-7070M)



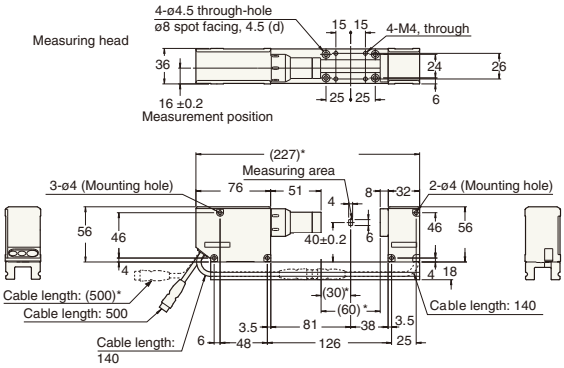
* Figures in parentheses are the values for the **LS-7070M**.

LS-7030 (LS-7030M)



* Figures in parentheses are the values for the **LS-7030M**.

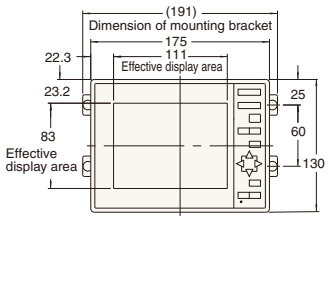
LS-7010 (LS-7010M)



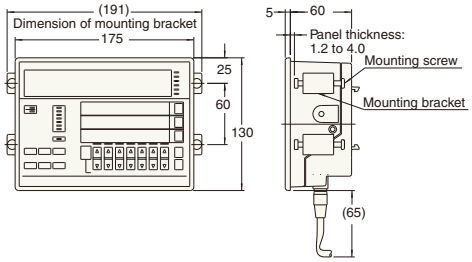
* Figures in parentheses are the values for the **LS-7010M**.

Controllers

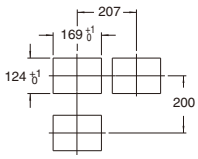
LS-7601



LS-7001



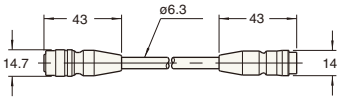
Panel cutout



Extension cables

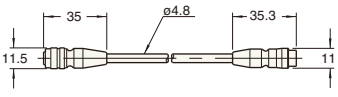
Cable between the controller and sensor head

LS-CxxA



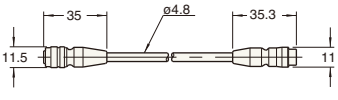
Camera cable between the controller and sensor head

LS-CxxAM



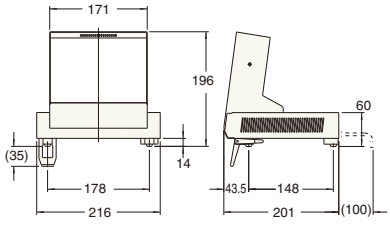
Cable between the receiver and transmitter

OP-4218x



AC power supply stand

LS-S11



Laser Scan Micrometers

LS-3100/5000 Series

CE

Features

- Repeatability of 0.3 µm
- Wide measuring range
- Touch-screen controller
- Up to four heads are connectable to one controller

Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

www.measurecentral.com

High resolution display of 0.05 µm

High-speed, high-precision calculation achieves a display resolution of 1/2* that of previous models. This enables stable high-precision measurement at the sub-micron level.
* Based on KEYENCE findings.

Large touch screen for easy operation

The system is operated via a touch screen, in which menu items are selected simply by touching the screen.

Wide measuring range

Objects from 0.2 to 120 mm in diameter can be measured. The LS-5121 increases transmitter/receiver distance to a maximum of 1000 mm.

Connects up to four scanning heads

Up to four scanning heads can be connected to a single controller for centralised control. This provides a low-cost system for measuring multiple lines simultaneously.

Lineup

Measuring head

Type	Standard	Wide range	Fine measuring		Standard			Wide range
Scanning head type	Separate		Single-body	Separate	Single-body	Separate	Single-body	Separate
Model	**LS-5041**	**LS-5121**	**LS-3034**	**LS-3033SO (8073)**	**LS-3032**	**LS-3033**	**LS-3036**	**LS-3060**
Measuring range	0.2 to 40 mm	0.8 to 120 mm	0.08 to 30 mm		0.3 to 30 mm	0.5 to 30 mm	0.3 to 30 mm	0.8 to 60 mm
Repeatability	±0.3 µm max.	±1 µm max.	±0.3 µm					±0.5 µm
Laser scan rate	1200 scans/s		400 scans/s					
Scanning head shape								

Specifications (LS-5000)

Controller

Type		Built-in display	Separate display
Model		**LS-5501**	**LS-5001**
Number of connectable scanning heads		4 max.	
Display	Measurement display	LCD display	—
	Display range	-99.99995 to 999.99995 mm	—
	Display units	mm/inches selectable	—
	Tolerance check output display	7-level LCD indicator	—
	Laser emission indicator	LCD (Green LED at scanning head)	—
Terminal block input	Program selection input	Non-voltage input (contact/solid state)	
	Laser stop input		
Interface	RS-232C	Measurement data output and control output	
I/O board*1	Input	Timing input, Reset input, Auto-zero input	
		Non-voltage input (contact/solid state)	
	Analogue voltage output	±10 V Output impedance: 100 Ω	
	7-level comparator output	100 mA max. (40 V max.)	
Power supply voltage		85 to 264 VAC, 50/60 Hz	24 VDC ±10
Power consumption		85 VA max.	1.4 A max.
Ambient temperature (No condensation)		0 to 40°C	0 to 45°C
Relative humidity		35 to 85%, No condensation	
Weight		Approx. 3.7 kg	Approx. 1.1 kg

Display unit

—
LS-D501*2
—
LCD display
-99.99995 to 999.99995 mm
mm/inches selectable
7-level LCD indicator
LCD (Green LED at scanning head)
—
—
—
—
—
24 VDC ±10%
0.6 A max.
0 to 40°C
35 to 85%, No condensation
Approx. 0.7 kg

*1 The I/O board is optional.
*2 The LS-D501 does not comply with EMC directive.
Note: BCD output is available as an option. Please inquire with KEYENCE.

Measuring head

Type			Standard	Wide range
Model	Scanning head		**LS-5041**	**LS-5121**
	Controller		**LS-5501/LS-5001**	**LS-5501/LS-5001**
Measuring range			0.2 to 40 mm	0.8 to 120 mm
Minimum target width			0.2 mm	0.8 mm
Transmitter/receiver distance			160 ±40 mm	400 ±100 mm, 1000 mm max. *1
Light source			Visible red semiconductor laser	
	Output		0.8 mW (FDA (CDRH) Part 1040.10), 130 µW (IEC 60825-1)	0.6 mW (FDA (CDRH) Part 1040.10), 45 µW (IEC 60825-1)
	Pulse duration		63 µs	14 µs
	Wavelength		670 nm	
	Laser Class	FDA (CDRH) Part 1040.10	Class II Laser Product	
		IEC 60825-1	Class 2 Laser Product	
Measurement accuracy			±2 µm max.*2	±8 µm max.*3
Repeatability			±0.3 µm max.*4	±1 µm max.*5
Display repeatability			0.05 µm	
Laser scan rate			1200 scans/sec	
Laser scan velocity			121 m/sec	504 m/sec
Laser scan range			Approx. 46 mm	Approx. 124 mm
Enclosure rating			IP64	IP65
Ambient temperature			0 to 50°C, No condensation	
Relative humidity			35 to 85%, No condensation	
Weight			Approx. 1.4 kg (including base)	Approx. 5.5 kg (including base)

*1 The measurable area is within 800 mm from the transmitter.
*2 When a round rod 10 mm in diameter is measured in a 10 mm x 20 mm measuring area.
*3 When a rod 40 mm in dia. is measured in a 40 mm x 80 mm measuring area.
*4 When the average number of measurements is set to 768 in a 10 mm x 20 mm measuring area.
*5 When the average number of measurements is set to 768 in a 40 mm x 80 mm measuring area.

Specifications (LS-3100)

Standard controller/2-head controller

Type			Fine measuring		Standard			Wide range
Scanning head type			Single-body	Separate	Single-body	Separate	Single-body	Separate
Model	Scanning head		**LS-3034**	**LS-3033SO(8073)**	**LS-3032**	**LS-3033**	**LS-3036**	**LS-3060**
	Standard controller/ 2-head controller		**LS-3100/LS-3100D**					
Measuring range	Scanning head		0.08 to 30 mm*1	0.08 to 30 mm*1	0.3 to 30 mm	0.5 to 30 mm	0.3 to 30 mm	0.8 to 60 mm
	Controller		mm/inch selectable					
Minimum target width			0.08 mm	0.08 mm	0.3 mm	0.5 mm	0.3 mm	0.8 mm
T and R distance*4			60 mm	120 mm (Fixed)	60 mm	120 ±40 mm	60 mm	200 ±50 mm
Light source			Invisible infrared semiconductor laser				Visible red semiconductor laser	
	Output		3.0 mW (FDA), 55 µW (IEC)				0.5 mW (FDA), 35 µW (IEC)	0.5 mW (FDA), 20 µW (IEC)
	Wavelength		780 nm				670 nm	
	Pulse duration		111 µs					55.6 µs
	Laser Class	FDA (CDRH) Part 1040.10	Class I Laser Product				Class II Laser Product	
		IEC 60825-1	Class 1 Laser Product					
Measurement accuracy			±2 µm max.*2					±3 µm max.*3
Repeatability (number of averaging measurements: 512)			±0.3 µm					±0.5 µm
Display resolution			0.1 µm					
Laser scan rate			400 scans/s					
Laser scan velocity			63 m/s					126 m/s
Laser scan range			Approx. 33 mm					Approx. 65 mm
Measured value			Main display: 7-segment green LED (8 digits) Sub display: 16 character x 2 line LCD (Backlight colour: yellow-green)					
Minimum display unit			0.1 µm/0.2 µm					
Display range			-999.9999 to 9999.9999					
Target position indicator			Green LED (7 levels)					
Comparator output indicator			Green LED x 3 (HI/GO/LO)					
Laser emission indicator			Green LED x 2 (HEAD 1/HEAD 2)					
Terminal block I/O	Control I/O		Hold synchronous, LASER REMOTE, PROGRAM SELECT (Program Nos. 1 to 5)					
			Non-voltage input (contact/solid state)					
	Analogue voltage		±6 V, Output impedance: 0 Ω					
	Contact output		Relay output: 3PST-NO contact, 250 VAC, 2 A (resistive load)					
36-pin connector I/O	Control input		Hold synchronous, AUTO ZERO SET/RESET, PROGRAM SELECT (Program Nos. 1 to 5)					
			TTL level, negative logic					
	Control output	7-level/3-level	40 mA max. (30 V max.)					
Interface port			RS-232C/GP-IB (optional)/BCD (optional)					
Power supply			85 to 264 VAC, 50/60 Hz					
Power consumption			40 VA max.					
Ambient temperature	Scanning head		0 to 45°C				0 to 40°C	
	Controller		0 to 45°C					
Relative humidity			35 to 85%, No condensation					
Weight	Scanning head*3		0.8 kg	T: 0.5 kg R: 0.4 kg	0.8 kg	T: 0.5 kg R: 0.4 kg	0.8 kg	Approx. 2.5 kg (base included)
	Controller		Approx. 4.6 kg					

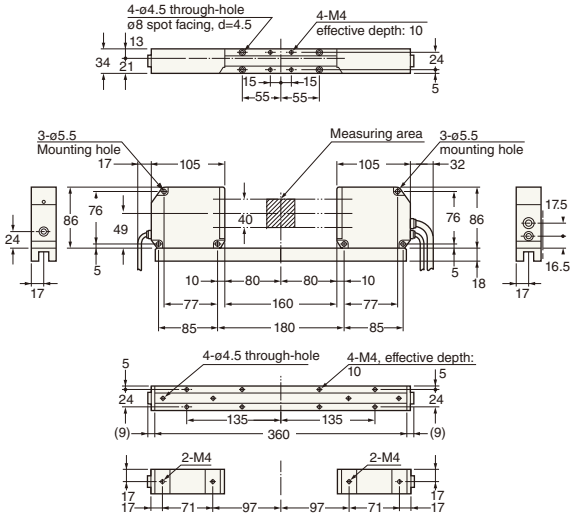
*1 When the outer diameter is measured.
*2 When a rod 10 mm in diameter is measured in a 2 x 20 mm, 4 x 20 mm, or 10 x 20 mm measuring area.
*3 When measuring a rod 20 mm in diameter in a 20 x 40 mm measuring area.
*4 'T' indicates a transmitter, 'R' indicates a receiver.

Dimensions

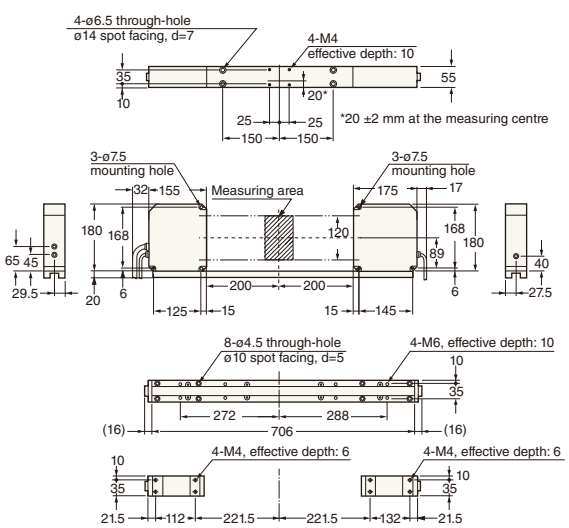
Scanning heads

Unit: mm

LS-5041

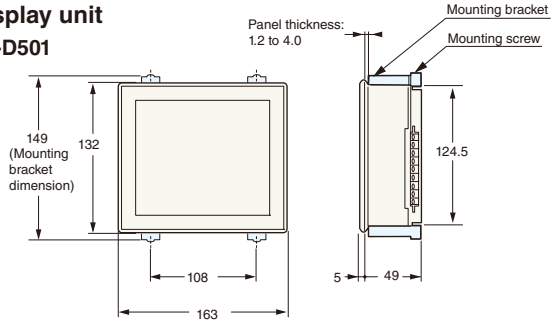


LS-5121



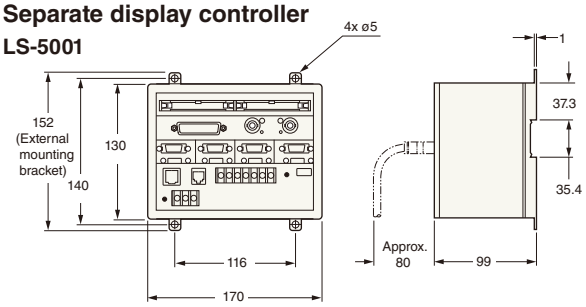
Display unit

LS-D501

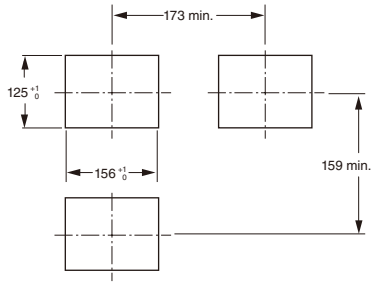


Separate display controller

LS-5001

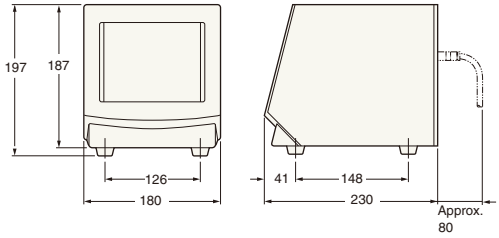


Panel cutout



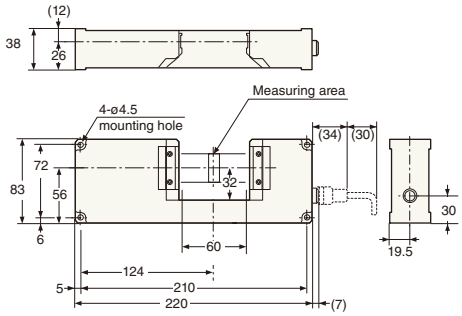
Built-in display controller

LS-5501

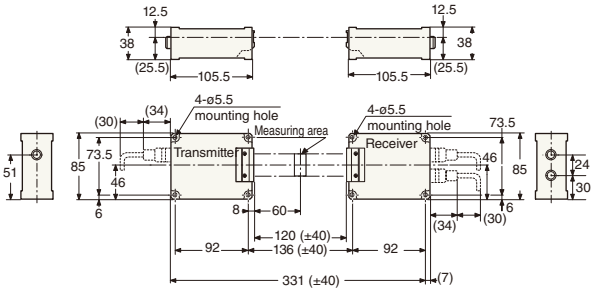


Scanning heads

LS-3032/3034/3036

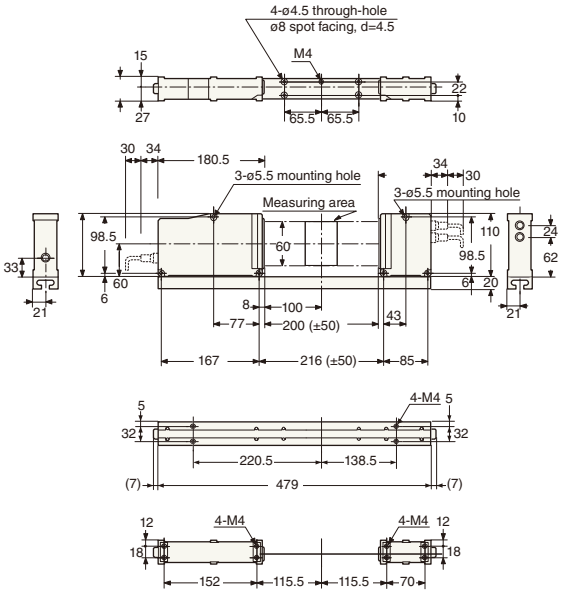


LS-3033/3033SO(8073)



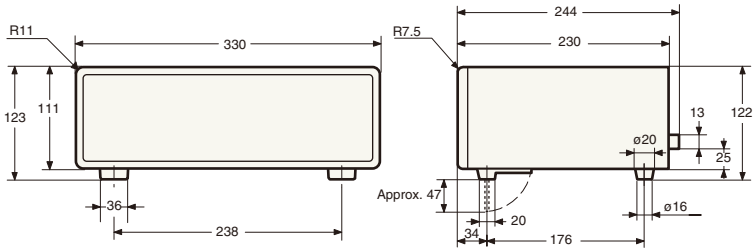
* Distance is fixed for **LS-3033SO (8073).**

LS-3060



Controllers

LS-3100 (LS-3100D)



High-speed 2D Measurement Sensor

NEW

TM-3000 Series

CE

Features

- Multi-point 2D measurement
- Tilt correction for inline measurement
- High-speed sampling of 5.5 ms

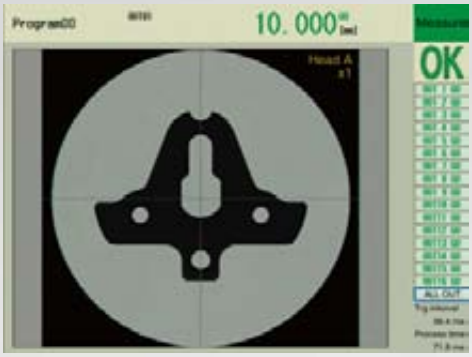
Expert Engineering Sites

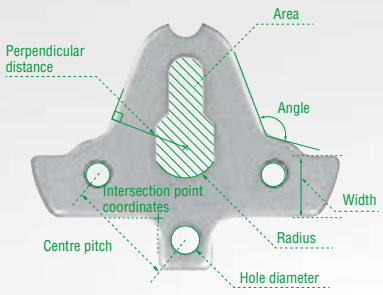
A new site with answers to all of your difficult measurement application questions

www.measurecentral.com

Because the system works in two dimensions it can...

Simultaneously measure dimensions that require both X and Y values. In addition, inspection time is reduced due to the elimination of motion components.



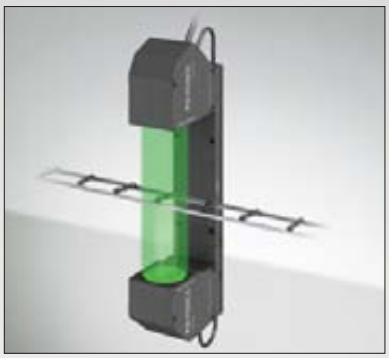


Example of measurement

: Hole diameter
: Centre pitch
: Intersection point coordinates
: Radius
: Width
: Angle
: Perpendicular distance
: Area

Position correction function [edge correction/pattern correction]

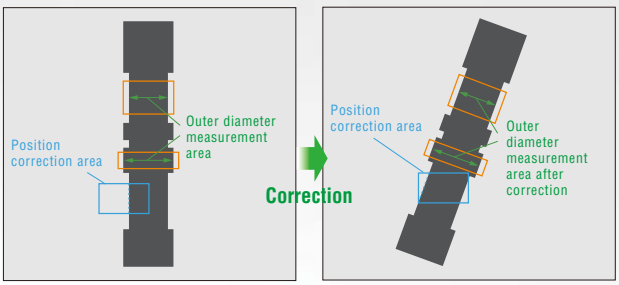
Automatically corrects misalignments and tilt of the target which is directly linked to measurement errors. Can measure accurately even when positioning is difficult or objects are conveyed in random orientations.



Because the measurement area autotracks according to the position and tilt of objects within the compensation area, it can be measured accurately.

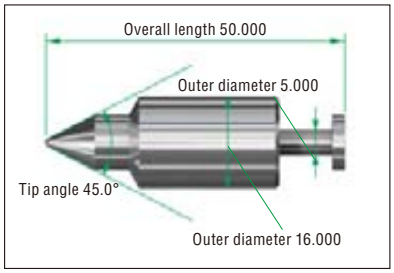
Master image

Measured image

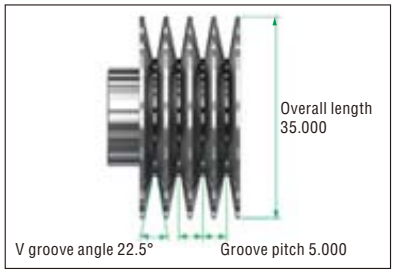


Applications

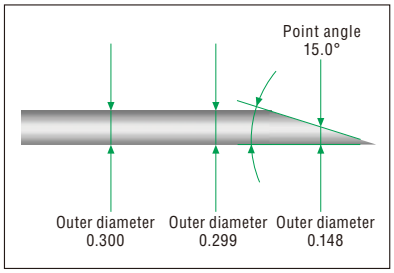
Unit: mm



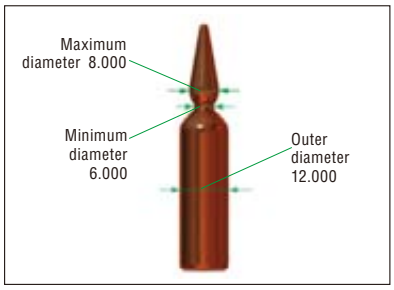
Measures outer diameter/tip angle of needle valves



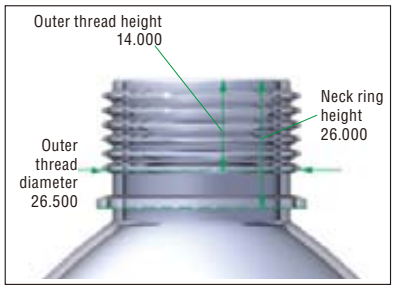
Measures pulley groove pitches/V groove angles



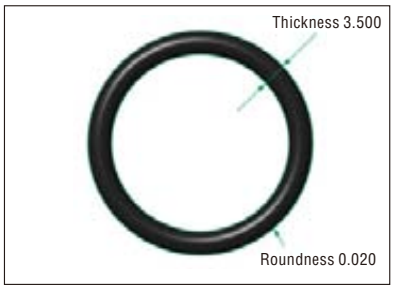
Measures multi-point outer diameter/point angle of injection needles



Measures maximum diameter/minimum diameter of ampules



Measures outer diameter and threading a PET bottle



Measures roundness/thickness of O-rings

Lineup

Sensor head

Type	Model	Appearance
ø6 mm type	**TM-006**	
ø40 mm type	**TM-040**	
ø65 mm type	**TM-065**	

Controller

Type	Model	Appearance
Standard type	**TM-3001**	
PNP Output type	**TM-3001P**	

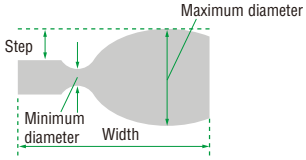
Features

Diverse measurement modes

A flexible combination of 15 types of basic measurement modes, and 8 types of auxiliary measurement modes, can support a variety of inspections.

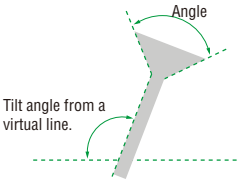
Outer diameter/Step/Width

Measures a maximum diameter/minimum diameter within the specified area, and a step/width between the detected edges.



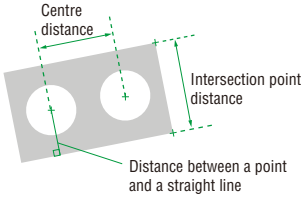
Angle

Measures an angle between two detected straight lines, and a tilt angle from a virtual line.



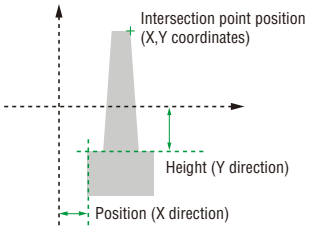
Distance/Intersection Point Distance

Measures a centre of the circles and intersection point, distance between 2 specified points, distance from a point to a straight line.



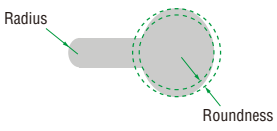
Height / Position/Coordinates

Measures height/ position of detected edges and coordinates of specified points.



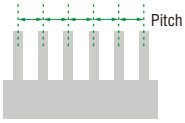
Radius/Roundness

Measures radius and roundness of specified arc.



Pitch

Measures a maximum/minimum/average pitch within the specified area.



Specifications

Sensor head

Model		TM-006	TM-040	TM-065
Measuring range		ø6 mm	ø40 mm	ø65 mm
Smallest detectable object		0.04 mm	0.3 mm	0.5 mm
Transmitter/receiver distance		60 mm	180 mm	270 mm
Light source		GaN Green LED	InGaN Green LED	
Measurement accuracy		±0.5 µm*1	±2 µm*3	±3 µm*5
Repeatability		±0.06 µm*2	±0.15 µm*4	±0.2 µm*6
Sampling cycle (trigger interval) *7		5.5ms (33ms at the initial setting)		
Environmental resistance	Enclosure rating *8	IP64		
	Ambient temperature	0 to 50°C		
	Relative humidity	35 to 85% (No condensation)		
Material		Aluminium		
Weight	Transmitter	Approx. 140g	Approx. 560g	Approx. 1280g
	Receiver	Approx. 340g	Approx. 720g	Approx. 1460g
	Base	Approx. 220g	Approx. 630g	Approx. 1500g

*1 In a measurement area of 2 mm × ø4 mm error when measuring width of KEYENCE standard object (glass calibration scale).
*2 Value of ±2σ measuring the width of KEYENCE standard object (glass calibration scale) in the centre of the measurement area, an average 16 times, average 1.3 mm line.
*3 In a measurement area of 10 mm × ø26 mm error when measuring width of KEYENCE standard object (glass calibration scale).
*4 Value of ±2σ measuring the width of KEYENCE standard object (glass calibration scale) in the centre of the measurement area, an average 16 times, average 8 mm line.
*5 Error when measuring width of KEYENCE standard object (glass calibration scale) in a measurement area of 20 mm × ø40 mm.
*6 Value of ±2σ measuring the width of KEYENCE standard object (glass calibration scale) in the centre of the measurement area, an average 16 times, average 14 mm line.
*7 When measurement area is minimum, others are initial settings
*8 Apart from connector component

Controller

Model		TM-3001	TM-3001P
Sensor head compatibility		Compatible	
Number of connectable sensors *1		2 units max.	
Display	Minimum display unit	0.01 µm, 0.001 mm², 0.01°	
	Maximum display range	±9999.99 mm, ±99999.9 mm², ±99999.9°	
Input terminal block	Laser remote interlock input	Non-voltage input	Non-voltage input
	Trigger input (for Head A)		Voltage input
	Timing 1 input		
	Auto-zero 1 input		
	Reset input		
Output terminal block	Analogue voltage output	±10 V x 2 outputs, out put impedance: 100 Ω	
	Total judgment output	NPN open-collector output	PNP open-collector output
	Error output	NPN open-collector output (N.C.)	PNP open-collector output (N.C.)
	Process output	NPN open-collector output	PNP open-collector output
	Trigger input enable output		
	Adjusted error output		
Expansion connector	Trigger input (for Head A)	Non-voltage input	Voltage input
	Timing 2 input		
	Auto-zero 2 input		
	Program switching input	Non-voltage input, 4 inputs	Voltage input, 4 inputs
	Memory card save input	Non-voltage input	Voltage input
	Judgment/Binary output*2	3-level judgment output: OUT1 to OUT16, total judgment output Binary output: OUT1 to OUT16 measured data output (21 bits) NPN open-collector output	3-level judgment output: OUT1 to OUT16, total judgment output Binary output: OUT1 to OUT16 measured data output (21 bits) PNP open-collector output
	Strobe output	NPN open-collector output	PNP open-collector output
	Trigger input enable output		
Analogue RGB monitor output		SVGA (800 x 600 pixels)	
RS-232C interface		Measured data output and control input/output (Maximum baud rate: 115200 bps, selectable)	
USB interface		In conformity with USB Revision 2.0 HI-SPEED (USB 1.1 Full-SPEED compatible)	
Ethernet interface		1000BASE-T/1000 BASE-TX/10 BASE-T	
Memory card		SD card CA-SD4G (4GB), CA-SD1G (1GB) support	
Major functions		Position correction function, OUT name change function, select measurement mode (outer diameter, height, step height, position, width, distance, intersection distance, angle, radius, roundness, coordinates, area, search, ring test, pitch) functions, OUT function between operators, auxiliary measurements (straight edge, circular edge, the edge bounding line, centre line, intersection, straight line between two points, any line, any point), functions, scaling function, average function, measurement function, measurement value alarm setting function, tolerance setting function, auto-zero function, storage (data/image) function, memory card storage function, program memory function, trigger mode change function, mutual interference prevention function, adjustable measuring range function, detection threshold value change function, mask function, attitude correction function, display language switching function, support software setting function, trigger interval-measurement time display function, others	
Ratings	Power supply voltage	24 VDC ±10%, Ripple: 10% (P to P) or less	
	Current consumption	1 head connected 480mA max./ 2 heads connected 550mA max.	
Environmental resistance	Ambient temperature	0 to 50°C	
	Relative humidity	35 to 85% (No condensation)	
Material		Polycarbonate	
Weight		Approx. 1120g	

*1 1 or 2 units can be connected only with the same head model
*2 OUT 1 to OUT 8 decision result, OUT 9 to OUT 16 decision result, time share output of binary measurement data.
• The rating of the NPN/PNP open collector output (output terminal block): 50 mA (30 V or less) max., residual voltage: 1.4 V or less (50 mA) 1.0 V (20 mA)
• The rating of the NPN/PNP open collector output (expansion connector): 50 mA (30 V or less) max., residual voltage: 1.0 V or less
• Rating for non-voltage input, ON voltage 1V max., OFF current 0.3mA max. (trigger input terminal, ON voltage 5V max., OFF current 1mA max.)
• Voltage rating, maximum rating 26.4V, ON voltage 10.8V, OFF current 0.3mA (trigger input terminal maximum rating 26.4V, ON voltage 10.8V, OFF current 1mA)

Operating system environment

CPU	Pentium III 1GHz min. (recommended 1.7GHz min.)
Support OS	Windows 7 *1 Windows Vista *2
	Windows XP Professional Edition/Home Edition
	Windows 2000 Professional
Memory capacity	512MB min. (1GB min. recommended)
Resolution of display	XGA (1024 x 768 pixels) min, 256 colours min.
Free disk space	1GB min.
Interface *3	As described above, all those mounted, USB2.0/1.1 *4, Ethernet *5

* For your OS, use environments above that recommended.
*1 Supports all editions Home Premium, Professional, Ultimate.
*2 Supports all editions Ultimate, Business, Home Premium, Home Basic. 64 bit versions are not supported.
*3 Communicate selecting any of them. Simultaneous communication is not possible.
*4 Connection through a USB hub is not included in the guarantee.
*5 Connection to LAN and connection via a router is not included in the guarantee.
• Windows Vista, Windows XP, Windows 2000 Professional are registered trademarks of US Microsoft Corporation.
• Pentium is a registered trademark of intel Corporation.

Controller

Controller
TM-3001(P)

Controller lineup

NPN Output type	**TM-3001**
PNP Output type	**TM-3001P**

Sensor head

Sensor head
ø6 mm type
TM-006

Sensor head
ø40mm type
TM-040

Sensor head
ø65mm type
TM-065

Console (Optional)
OP-82125

Setting and support software
TM-H1

USB cable (Optional)
OP-66844

Monitor

High-resolution monitor
CA-MP81

Monitor stand
OP-42278

Cable - connector

Cable between head and controller
CB-A××
(0.7, 2, 5, 10, 20, 30m)

Transmitter to receiver expansion cable
OP-87033 (1m)
OP-87034 (3m)

Cable between controller - monitor
OP-66842 (3m)

I/O connector cable
OP-51657 (3m)

Ethernet cable
OP-66843 (3 m)

RS-232C communication cable
OP-96368 (2.5m)

D-sub9 pin conversion connector
OP-26401

D-sub25 pin conversion connector
OP-96369

Option

Protective cover
OP-87035 (2 per pack)
(for **TM-040**)
OP-87036 (2 per pack)
(for TM-065)

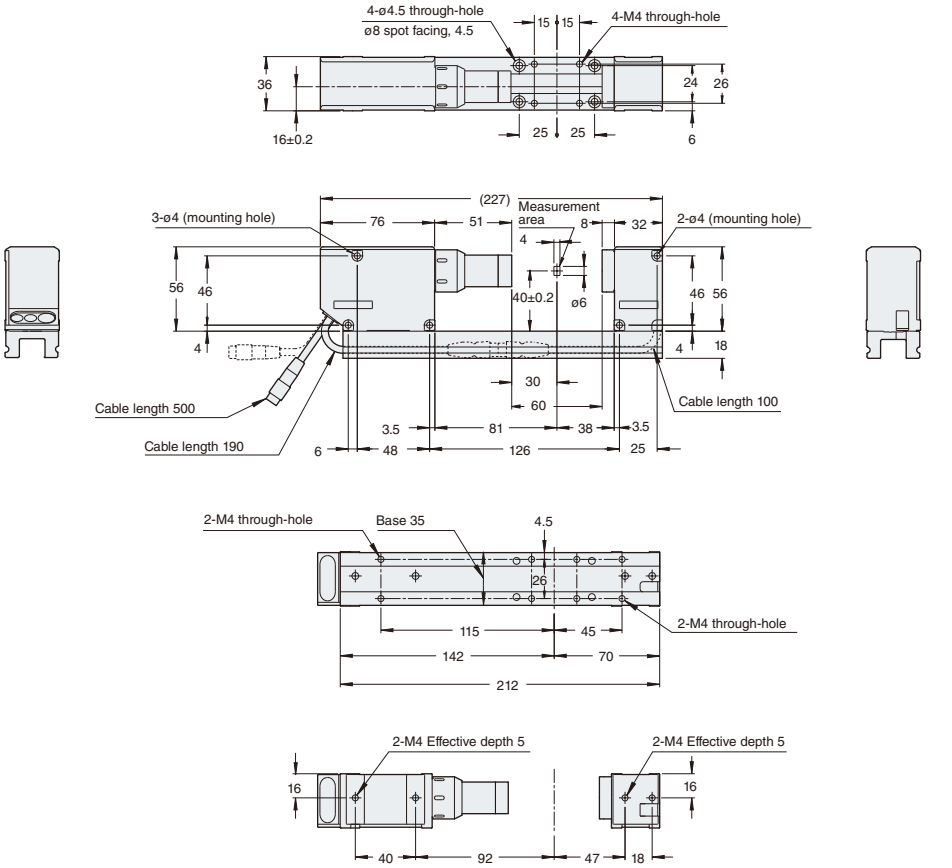
Memory card
CA-SD4G (4GB)
CA-SD1G (1GB)

Dimensions

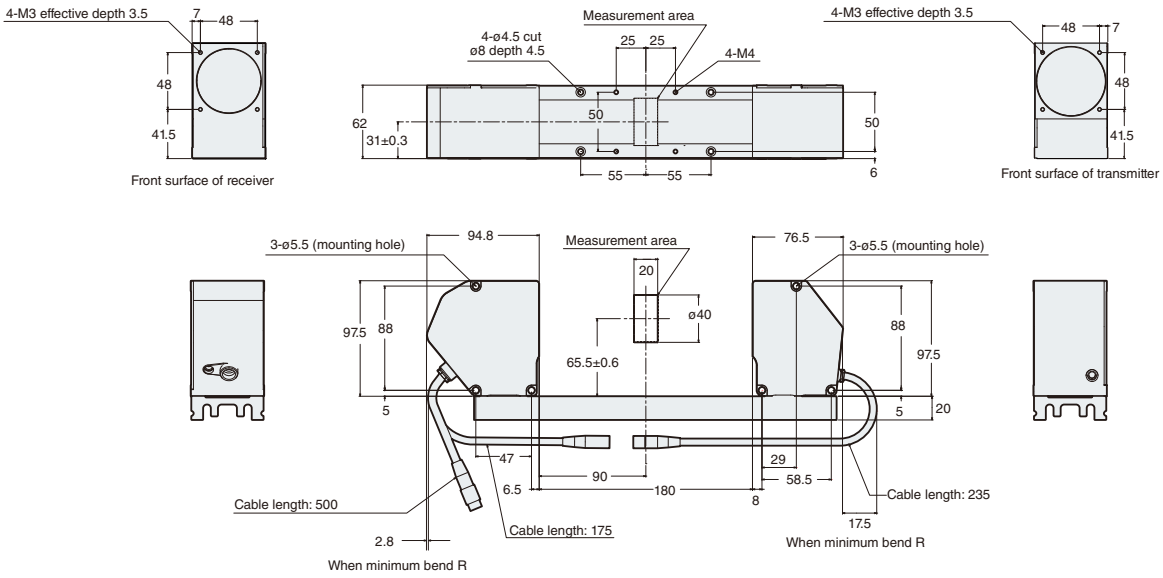
Sensor heads

Unit: mm

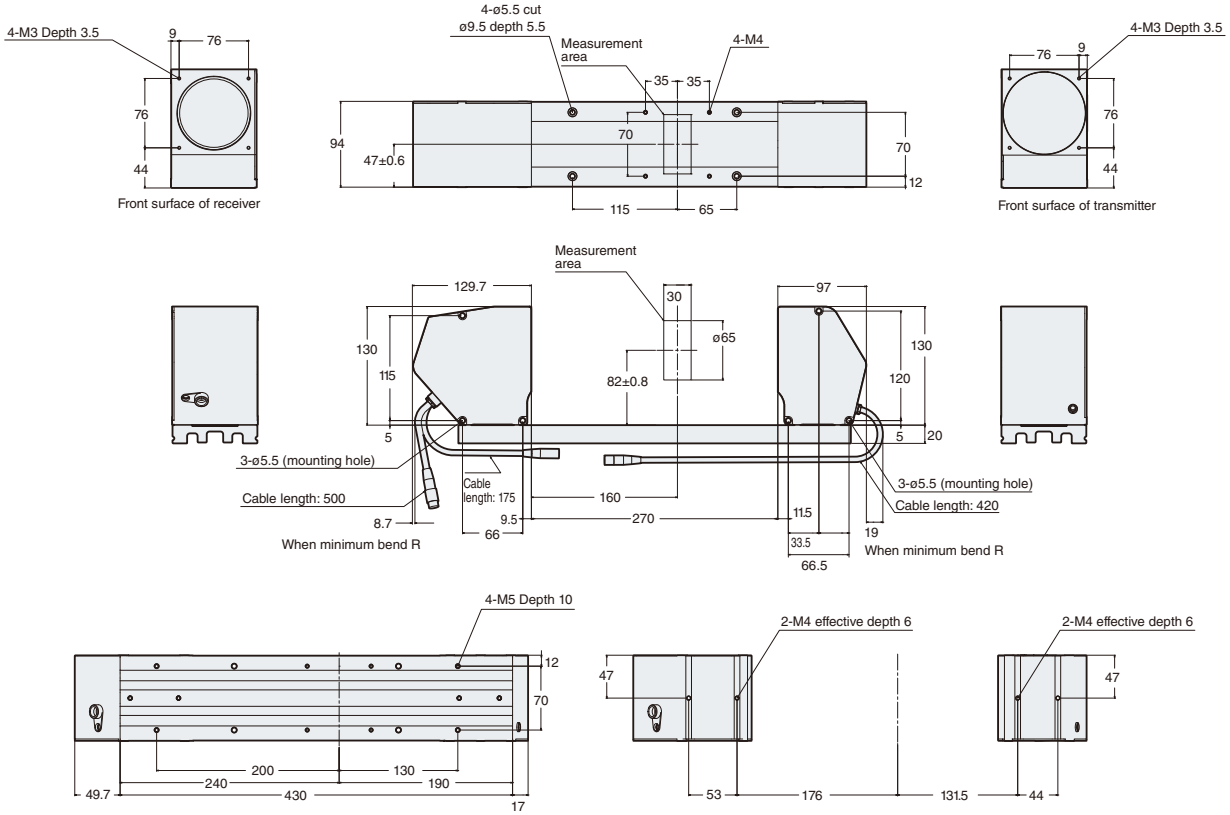
TM-006



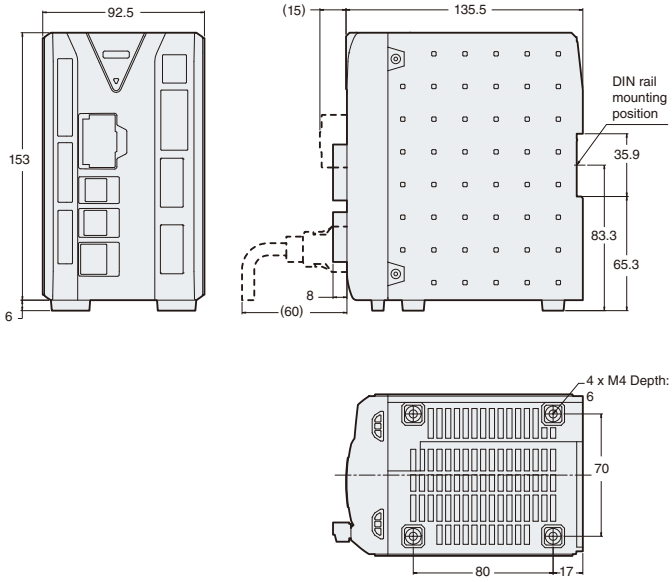
TM-040



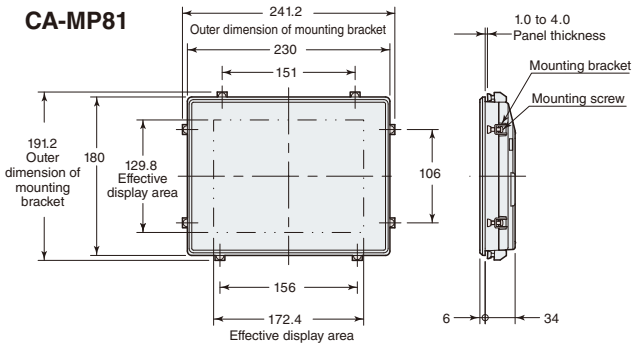
TM-065



TM-3001(P)



LCD monitor CA-MP81



Stand OP-42278

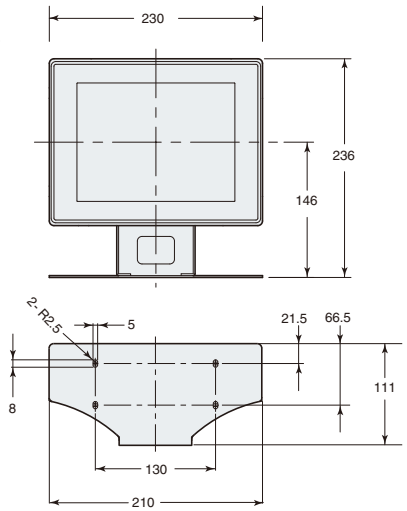


Image Dimension Measurement System

IM-6500 Series

CE

99 features are measured in seconds.

Just place a target

And press the button.

All points are measured in seconds.

Expert Engineering Sites

A new site with answers to all of your difficult measurement application questions

www.measurecentral.com

Drastically Reduced Measurement Time

Just place and press: 99 features are measured in seconds.

Just place a target and press the button. Ninety-nine points are measured in seconds. The system automatically finds and measures targets even when they are placed in a different location or orientation, which significantly reduces measurement time.

Eliminating Operator Errors

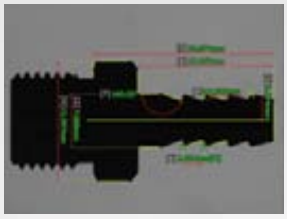
High-precision automatic measurement using the latest image processing technology

Since the shape of a target is automatically recognised before measurement, the result is not affected by individual differences such as alignment errors or variations in the skill level of equipment users. The same results can be obtained consistently no matter who is taking the measurements.

Easy Setup for Difficult Applications

Easy setup by checking the entire image of a target

Even the initial setup is easy, just specify points with the mouse while checking the entire image of a target. You can easily complete the setup procedure for a wider range of measurements from outer diameter, circular pitch, and angle measurements to measurements using virtual lines or points.



Easy Data Management

Statistics/analysis function for easy trend checking or reporting

All measurement results will be saved automatically. The included statistics and analysis function allows easy checking of the points for improvement and preparation of inspection records. Of course, measurement data can be imported to and used on spreadsheet software or exported in real time to a data server.

Improved quality | Cost efficiency | Shorter lead time

Four Features will Support your QCD Improvement.

Description

ADVANCED TECHNOLOGIES FOR ACHIEVING "PLACE-AND-PRESS" MEASUREMENT

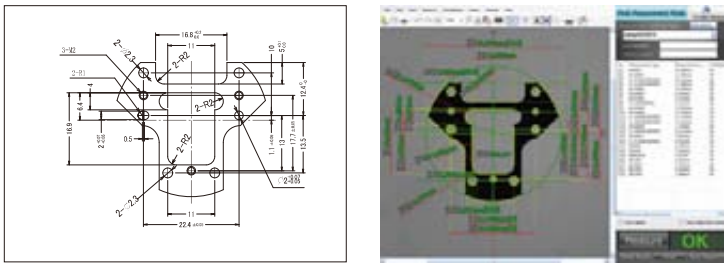
Pattern search for automatic orientation correction Industry first

The location and orientation of the target placed on the stage are automatically adjusted based on the recorded shape of the target. There is no need for positioning of a target or preparation of a jig at the beginning of measurement. This is literally place-and-press measurement.

The location and orientation of the target placed in the field of view are automatically adjusted for measurement.

Simultaneous measurement of 99 features by capturing an entire part Industry first

This is a completely new measurement system which measures by capturing the entire image of a target within the field of view. It does not require time for alignment of the stage and completes the measurement of 99 features in seconds. Measurement time can be reduced significantly compared with conventional optical comparators, measuring microscopes and optical CMMs.



Even when many feature are specified on a dimension drawing, all features can be measured within a few seconds.

Batch measurement for further reduction in measurement time Industry first

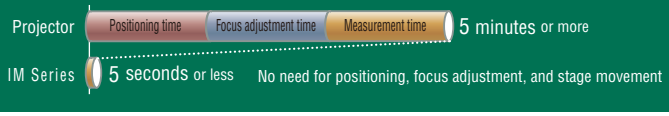
The dimensions of all targets on the stage are measured simultaneously. Even when the targets are placed randomly, it is unnecessary to align them in a jig because the location and orientation of each target is automatically adjusted before measurement. This further reduces measurement time.

Even targets placed randomly are measured simultaneously.
Clicking each target shows its measurement result.

SIGNIFICANT TIME REDUCTION

In addition to the inspection time, the standby time during product changeover is also reduced. This helps improve the facility utilization ratio and reduce costs.

Example: When 5 or more minutes are required to measure 10 points with an optical comparator

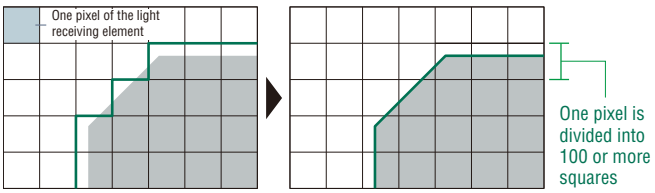


Sub-pixel processing for measurement down to one hundredth or less of one pixel

Best in its class

Latest technologies to eliminate operator variation

One pixel of the light receiving element is divided into 100 or more squares and used as a unit for shape recognition. This allows high-resolution measurement in a wider field of view. The optical system is also taken into consideration to improve accuracy.



Without sub-pixel processing
The target is measured by one pixel of the light receiving element.

With sub-pixel processing
The target is measured by one hundredth or less of a pixel of the light receiving element.

Just click the points to be measured with the mouse

Easy point and click programming interface

To set up feature inspections, just select the desired tool from the menu and roughly specify the measurement points on the screen with the mouse. Since the entire image of a target is displayed, you can set details intuitively through simple mouse operations.

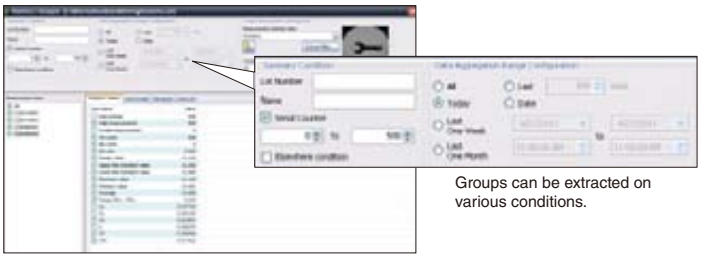
Select a desired measurement type from the menu.

Roughly specify the measurement points with the mouse.

Automatic calculation of major statistical values. Group extraction is also easy.

Statistics/analysis functions

Critical statistical values required for inspection reports are automatically calculated and displayed, including maximum, minimum, average, σ, 3σ and CPK. You can also set various conditions for group extraction for statistical, analysis, and inspection records.



Groups can be extracted on various conditions.

Critical statistical values required for inspection reports are provided by default.

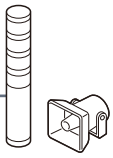
System configuration

Head
IM-6010/6020

Controller
IM-6500E

RGB — Monitor

LAN — PC



Indicator, buzzer, etc.

USB — Inkjet printer

Foot switch

Accessories

Sapphire glass for the measurement stage
OP-86986
Normal glass: **OP-86985**

Specifications

Model	Controller	IM-6500E	
	Head	IM-6010	IM-6020
Image pickup device		1" 6.6 mega pixel CMOS	
Display		10.4" LCD monitor (XGA: 1024 x 768)	
Light receiving lens		Double telecentric lens	
Field of view	Wide-field measurement mode	ø100 mm	ø100 mm
	High-precision measurement mode	–	ø25 mm
Minimum display unit		0.1 µm	
Repetition Accuracy	Wide-field measurement mode	±1 µm	±1 µm
	High-precision measurement mode	–	±0.5 µm
Measurement accuracy	Wide-field measurement mode	±5 µm*1	±5 µm*1
	High-precision measurement mode	–	±2 µm*2
External remote input		No-voltage input (with and without contact)	
External output	Comparator output (OK/NG/FAIL)	Relay output/rated load: 24 VDC 0.5A/ON resistance: 50 mΩ or less	
Interface	LAN	RJ-45 (10BASE-T/100BASE-TX/1000BASE-T)	
	USB 2.0 series A	6 ports (Front: 2, Rear: 4)	
Record	Hard disk drive	160 GB	
Resistance to environment	Operating ambient temperature	+10 to 35°C	
	Operating ambient humidity	20% to 80% RH (no condensation)	
Illumination system	Coaxial transparent illumination	Telecentric transparent illumination (green LED)	
	Ring epi-illumination	Four division ring illumination (white LED)	
Z-axis stage	Moving range along Z axis	30 mm	
	Withstand load	3 kg	
Power supply	Power supply voltage	100 to 240 VAC 50/60 Hz	
	Power consumption	180 VA max.	
Weight	Controller	Approx. 8 kg	
	Head	Approx. 24 kg	Approx. 25 kg

*1 ±2σ in the range of ø80 mm from the centre of the stage at the operating temperature range of +23±1.0°C degrees at the focused focal point position
*2 ±2σ in the range of ø20 mm from the centre of the stage at the operating temperature range of +23±1.0°C degrees at the focused focal point position

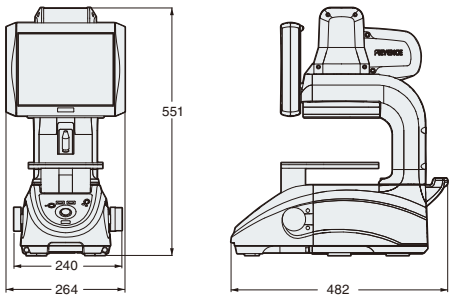
Measurement points		99 points max. (99 x 9 points possible when the measurement setting binding function is used)
Pattern search (Profile tracking function)		XYθ (with 360° rotary position compensation)
Registration of measurement configuration		1000 or more*3
Basic measurement function	Distance measurement	8 types (point-point/line-point/line-line/circle-point/circle-line/circle-circle/circle/arc)
	Angle measurement	Provided
	Calculation	Provided
Virtual line function	Point	Middle point/intersection
	Conjunction edge	Line conjunction/circular conjunction
	Line	6 types (midline/perpendicular line/parallel lines/tangent line/line passing through the point/approximate line)
	Circle	Middle circle/approximate circle/auxiliary circle
Application tool	Pitch measurement	Line/circumference
	Width measurement	Edge width
	Thickness measurement	Thickness measurement/Gap measurement between inner and outer diameters
	Special tool	Rounded corner/curved surface/oval/reticle/point position/perimeter
GD&T	Shape tolerance	Straightness/circularity/profile
	Orientation tolerance	Squareness/parallelism
	Position tolerance	Point position/concentricity
Element tool	Point	Point (on a line or arc)/maximum/minimum (rectangle, circle, arc)
	Line	Line/centreline
	Circle	Circle/arc
	Profile extraction	Provided
	Special tool	Automatic generation
Manual measurement		Provided
Coordinate system configuration		Provided
Batch configuration of tolerance		Provided
Element list editing		Provided
Measurement setting data binding function		Provided

*3 Depending on the measurement setting data and number of data pieces being stored

Dimensions

Head

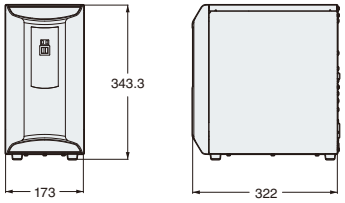
IM-6010/6020



Controller

IM-6500E

Unit: mm



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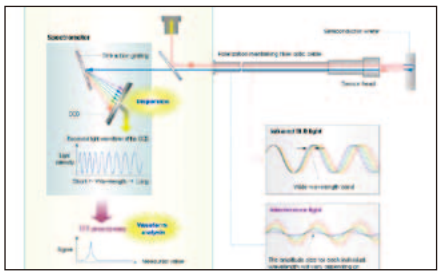

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WW1-1014

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MeasurementE-WW-GC2-GB 1024-2 600B48 Printed in Japan